

ENTOMOLOGICAL SOCIETY OF AMERICA EASTERN BRANCH

ENTOMOLOGY IN A CHANGING ENVIRONMENT

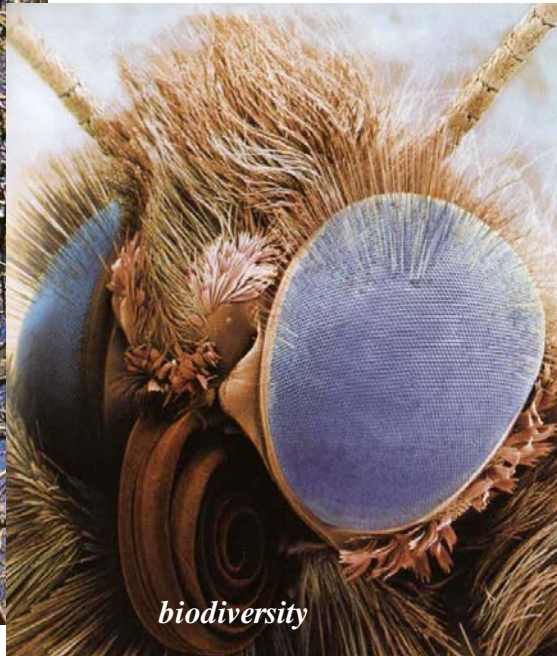
78th ANNUAL MEETING
March 18-20, 2007
Harrisburg Hilton Hotel
Harrisburg, PA



pest control

*As we acquire more
knowledge, things do
not become more
comprehensible, but
more mysterious.*

- Albert Schweitzer



biodiversity

*Climate
change*



The Program Encapsulated - 2007

SUNDAY

Morning	Executive Committee Meeting	9:00-12:00	Harrisburger
Afternoon	Registration	12:00-5:00	Lancaster lobby
	Local Arrangements	12:00-5:00	New Governor
	It's a Bug's World – Outreach	1:00-5:00	Whittaker Center
	Posters and Displays	1:00-7:30	Carlisle
	Student Oral Presentation Competition	12:00-5:00	York
Evening	ESA President's Address to the Members	5:30-6:00	York
	EB ESA President's Reception	6:00-7:30	Carlisle
	IDEP Workshop	6:00-7:30	Carlisle
	Student Networking	7:30-9:00	Leland

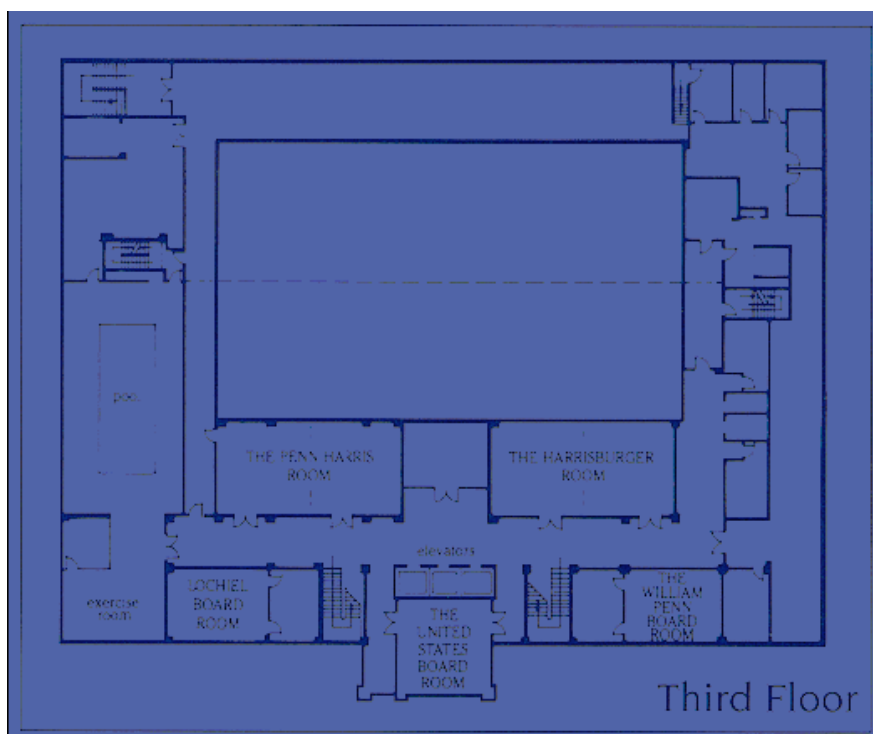
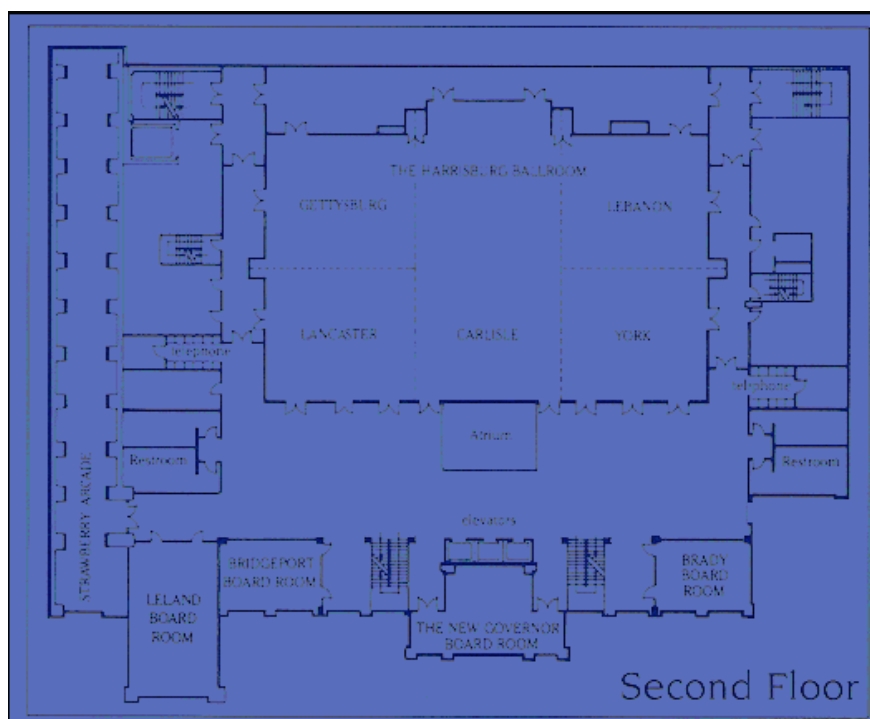
MONDAY

Morning	Registration	8:00-5:00	Lancaster lobby
	Local Arrangements	8am-9pm	New Governor
	Posters and Displays	8:00-5:00	Carlisle
	IDEP Symposium	8:00-12:00	Lancaster
	NE Region Field Crops Symposium	8:00-11:00	York
	Industry Symposium	8:00-12:00	Gettysburg
Afternoon	Ornamentals and Turf Symposium	1:00-5:00	Lancaster
	Student Symposium	1:00-4:00	York
	Fruit Symposium	1:00-5:00	Gettysburg
Evening	Social and cash bar	5:30-6:00	Carlisle
	Banquet and awards	6:00-8:30	York/Lebanon
	Linnaean Games	9:00	Lancaster

TUESDAY

Morning	Registration	8:00-10:00	Lancaster lobby
	Local Arrangements	8:00-11:00	New Governor
	Eastern Branch Business Meeting	7:00-7:45	Lebanon
	Posters and Displays	8:00-12:00	Carlisle
	Biological Control Symposium	8:00-12:00	Lancaster
	New Pesticide Discoveries Symposium	8:00-11:30	York
	Submitted Paper Presentations	8:00-12:00	Gettysburg
	Adjourn	12:00	

Harrisburg Hilton Floor Plan



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Thank you!

2007 Eastern Branch ESA Award Winners

ESA Entomological Foundation Award for Excellence in Integrated Pest Management

Larry Hull



Dr. Larry Hull is a professor in the Department of Entomology at Penn State University. He joined the Department in 1997 and he is located at the Fruit Research and Extension Center in Biglerville. He is a native south-central Pennsylvanian and a graduate of Mount Saint Mary's University (BS) and The Pennsylvania State University (PhD). He trained under Professor Dean Asquith, one of the forefathers of IPM development and implementation in deciduous tree fruit crops throughout the U.S. Larry's research and extension program in deciduous tree fruit crops encompasses many IPM tactics such as biological control, sampling systems, economic thresholds, pheromone mating disruption, and reduced and selective use of chemical insecticides and their toxicity and selectivity towards natural enemies. He has recently initiated an area-wide pheromone mating disruption project for the management of both the codling moth and oriental fruit moth on pome and stone fruits in Pennsylvania. He and his graduate students and post-doctoral scholars have published numerous scientific papers to further the development and implementation of IPM programs for deciduous fruit systems. From 1998 until 2006 Larry served as the Director of the Fruit Research and Extension Center.

Eastern Branch Herbert T. Streu Meritorious Service Award

Jim Stimmel



Jim Stimmel has spent his entire 34-year career involved with insect survey and detection programs in the Bureau of Plant Industry, Pennsylvania Department of Agriculture, and he has been an active participant in ESA Eastern Branch activities for some time. Initially, he served as Branch photographer, snapping photos of award winners and officers during banquets and plenary sessions. In 1996 he became a member of the Insect Detection, Evaluation, and Prediction Committee (IDEP), and served as chair of this committee in the early 2000s. Since the major charge of the IDEP committee is the presentation of a symposium at each year's EB meeting, Jim has been either co- or sole organizer of many of the IDEP symposia during his tenure. He has contributed to the annual "IDEP Show-and-Tell" sessions at EB meetings. At the EB business in 1999 he successfully presented a proposal to place IDEP as a standing committee in the Branch. Jim has served as a member of the local arrangements committee for each of the meetings held in Harrisburg, and is a past member of the ESA Common Names Committee. He has also participated in the informal "student-employer information exchange" programs offered at recent EB meetings. On a lighter note, he has helped arrange the various 5K Run/Walks held at EB meetings, which have only recently been squeezed from our meetings by tight scheduling. A native central Pennsylvanian and graduate of the University of Pittsburgh, Jim is the Entomology Program Manager for the PDA, where he also functions as state survey entomologist.

L.O. Howard Distinguished Achievement Award

David Pimentel



David Pimentel is an emeritus professor in the Departments of Entomology and Ecology & Evolutionary Biology at Cornell University. He received his Ph.D. from Cornell University and began working as an Assistant Professor of Insect Ecology at Cornell in 1955. Few entomologists attain the international renown that Dr. Pimentel has garnered. Throughout his career, Dr. Pimentel has been especially concerned about our environment and, over the years, his interests have broadened as the importance of new issues became evident. While he has made very significant research contributions across a great diversity of subjects dealing with the environment and agriculture, he is probably best known across society for his research using the literature to recognize trends in interactions between humans and our environment. Thus, his research has spanned the fields of energy, ecological and economic aspects of pest control, biological control, biotechnology, sustainable agriculture, land and water conservation, and environmental policy. Dr. Pimentel has published more than 600 scientific papers and 23 books. Dr. Pimentel has taught many different courses and he still comes to campus daily and leads seminar courses. During his career, Dr. Pimentel trained at least 17 graduate students receiving either doctorates or master's degrees. He has also served on many national and government committees including the National Academy of Sciences; President's Science Advisory Council; U.S. Department of Agriculture; U.S. Department of Energy; U.S. Department of Health, Education and Welfare; Office of Technology Assessment of the U.S. Congress; and the U.S. State Department.

John Henry Comstock Award

Andrew E. Z. Short



Andrew Short will receive his PhD in systematic entomology in 2007 from Cornell University. He received a BS in Entomology from the University of Delaware in 2002, where he first developed an interest in the systematics and biology of aquatic beetles. He started his Ph.D. later the same year with Dr. James Liebherr at Cornell. In his dissertation research, Short has utilized morphology and molecular data to explore patterns of morphological and habitat evolution in the water scavenger beetles. He is particularly interested in patterns of evolution leading to secondary terrestriality. In addition to his phylogenetic work, Short is a collaborating specialist for aquatic beetles in biotic surveys around the world, including Costa Rica, Venezuela, Mongolia, and Thailand and serves as a research associate at the Instituto Nacional de Biodiversidad in Costa Rica and the Natural History Museum in Vienna, Austria.

Asa Fitch Memorial Award

Wilma V. Aponte-Cordero



Wilma V. Aponte-Cordero received her Bachelor of Science degree on Crop Protection from the University of Puerto Rico, Mayagüez Campus. She recently completed a Master of Science degree of Entomology at the Pennsylvania State University and studied the temperature dependent development of the soybean aphid, *Aphis glycines*. During her degree, she maintained an active membership and worked as the Chair of the Student Affairs Committee of the Eastern Branch Entomological Society of America. Wilma is currently a doctoral candidate of Entomology at the Pennsylvania State University and her research focuses on insect-plant interactions and greenhouse IPM.

SUNDAY MARCH 18, 2007

Sunday Morning

Executive Committee Meeting	<i>Harrisburger</i>	9:00-12:00
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Sunday Afternoon

Registration Mark Taylor, Maryland Dept. of Agriculture	<i>Lancaster Lobby</i>	12:00-5:00
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Local Arrangements Greg Krawczyk, Pennsylvania State University	<i>New Governor</i>	12:00-5:00
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Public Outreach Program	<i>Whittaker Center</i>	1:00-5:00
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“It’s a Bug’s World”

Organizer: Faith Kuehn, Delaware Department of Agriculture, Dover, DE

Thousands of bugs will converge on the Whitaker Center for “It’s a Bug’s World”, an insect event for teachers, parents, and kids presented by the Eastern Branch Entomological Society of America. The program is free to the public as well as to meeting registrants and their families. Displays will feature Pennsylvania butterflies and grasshoppers, insect cuisine, insect art, and conservation projects to save native bees by the Delaware Department of Agriculture and the endangered regal fritillary butterfly by the PA Department of Military and Veterans Affairs. Displays also include:

- ***Creating origami insects** led by Math in Motion’s Barbara Pearl
- ***The art of scientific illustration** demonstrated by Albert Spoo
- ***Insect photography and book signing** by Susan Ellis author of “*Aliens Among Us*”
- ***Insects of Pennsylvania**, Oakes Museum of Natural History, Messiah College
- ***Invasive insects threatening PA’s forest health**, PA Dept. of Conservation and Natural Resources
- ***Waterworld**, PA Dept. of Conservation and Natural Resources
- ***Bees and Beekeeping**, Penn State University
- ***Red imported fire ants**, Delaware Department of Agriculture
- ***Fear Factor Bugs**, Indiana University of Pennsylvania
- ***Fly tying and fly fishing**, Dauphin County Conservation District
- ***Bugs for the Gourmet**
- ***Plus insect buttons, insect jewelry, and insect art**

Sunday Afternoon

Student Poster Competition*

Carlisle

1:00-7:30

***See appendix A for abstracts of posters from this section**

[Author attendance at posters during President's Reception, Sunday 6:00 – 7:30 p.m.]

Organizer: Brian A. Nault, Department of Entomology, Cornell University, New York State Agricultural Experiment Station, Geneva, NY.

1. **Bionomics of *Ochlerotatus canadensis* in southwest Virginia, and the simultaneous survey for La Crosse virus.**
Nancy M. Troyano and Sally L. Paulson, Department of Entomology, Virginia Polytechnic Institute and State University, Blacksburg, VA.

2. **Large-scale spatial variation in community composition: local and latitudinal changes in salt marsh food webs.**
Jessica E. Hines and Robert F. Denno, Department of Entomology, College Park, MD.

3. **Spatio-temporal prediction of temperature-dependent diapause termination of Japanese hornfaced bee (Hymenoptera: Megachilidae) adults in West Virginia.**
Joseph B. White and Yong-Lak Park, Department of Entomology, Division of Plant and Soil Sciences, West Virginia University, Morgantown, WV.

4. **Differences in ground arthropod diversity in three different tillage systems of flue-cured tobacco.**
Lakshmipathi Srigriraju¹, Paul J Semtner² and David T Reed². (1) Department of Entomology, Virginia Polytechnic Institute and State University, Blacksburg, VA; (2) Virginia Polytechnic Institute and State University, Southern Piedmont Agricultural Research and Extension Center, Blackstone, VA.

5. **The aphid species composition in Central Pennsylvanian snap-bean fields, including *Aphis glycines*.**
Amanda C. Bachmann¹, William Sackett², Thomas Butzler³, Fredrick E. Gildow² and Shelby J. Fleischer¹. (1) Department of Entomology, Pennsylvania State University, University Park, PA; (2) Department of Plant Pathology, Pennsylvania State University, University Park, PA; (3) Clinton County Cooperative Extension, Pennsylvania State University, Mill Hall, PA.

6. **Stink bug (Heteroptera: Pentatomidae) egg parasitoids and apparent host preference in southeast Virginia.**
Amanda L. Koppel¹, Ames Herbert² and Thomas Kuhar³. (1) Department of Entomology, Virginia Polytechnic Institute and State University, Blacksburg, VA; (2) Virginia Polytechnic Institute and State University, Tidewater Agricultural Research and Extension Center, Suffolk, VA; (3) Virginia Polytechnic Institute and State University, Eastern Shore Agricultural Research and Extension Center, Painter, VA.

Sunday Afternoon

7. Field and laboratory assays to measure efficacy of selected synthetic and organic insecticides on green and brown stink bug.

Katherine L. Kamminga¹, Ames Herbert² and Thomas Kuhar³. (1) Department of Entomology, Virginia Polytechnic Institute and State University, Blacksburg, VA; (2) Virginia Polytechnic Institute and State University, Tidewater Agricultural Research and Extension Center, Suffolk, VA; (3) Virginia Polytechnic Institute and State University, Eastern Shore Agricultural Research and Extension Center, Painter, VA.

Submitted Posters

Carlisle

1:00-7:30

***See appendix B for abstracts of posters from this section**

[Author attendance at posters during President's Reception, Sunday 6:00 – 7:30 p.m.]

8. Patterns of macroinvertebrate community development in constructed seasonal wetlands and a restored Delmarva Bay on a Maryland farm.

Lauren E. Culler, Michelle R. Haube, and William O. Lamp, 4112 Plant Sciences Bldg., Department of Entomology, University of Maryland, College Park, MD

9. Colony and forager spatial patterns of *Formica exsecta* species group ants in forested wetlands.

Sylvio Codella, Department of Biological Sciences, Kean University, Union, NJ

10. Site variation in biodiversity of epigaeic ants and diapiiid wasps in urban conifer stands (Hymenoptera: Formicidae, Diapriidae)

Bruce Kuntz, Sylvio Codella, Jaroslaw Moczerniuk, and Katerine Raymondi, Department of Biological Sciences, Kean University, Union, NJ

11. Establishment of parasitoids of the lily leaf beetle (*Lilioceris lili*) in New England.

Lisa A. Tewksbury and Richard A. Casagrande, Dept. of Plant Sciences, University of Rhode Island, Kingston, RI

12. Low levels of parasitism of brown marmorated stink bug in the eastern US by native parasitoids.

Kim A Hoelmer, USDA ARS BIIR, 501 S. Chapel St; Newark, DE, Anne L Nielsen, Rutgers University, Dept of Entomology, New Brunswick, NJ, Gary L Bernon, USDA APHIS, Otis ANGB, MA, George C. Hamilton, Rutgers University, Dept of Entomology, New Brunswick, NJ

Sunday Afternoon

13. **Habitat Identification, Restoration, And Repatriation Plan For The Eastern Regal Fritillary (*Speyeria idalia idalia*) To Landholdings Historically Occupied Within The Northeastern United States.**
Virginia Tilden, Mark Swartz, David McNaughton, and Nick Hoffman, The Pennsylvania State University, Fort Indiantown Gap, PA, Joseph Hovis, Department of Military and Veterans Affairs, Fort Indiantown Gap, PA
14. **A Participatory Appraisal of IPM in High Value Horticultural Crops in Albania, Moldova and Ukraine.**
Douglas G. Pfeiffer, Dept. of Entomology, Virginia Tech, Blacksburg, VA
15. **Paternal age and season affect reproductive decisions in giant waterbugs, *Belostoma flumineum* Say.**
Gena L Coffey and Scott L Kight, Department of Biology and Molecular Biology, Montclair State University; Montclair, NJ
16. **Diet-induced Feeding Behavior of *Manduca sexta*.**
Will, C. Gretes, 9356 Spring Water Path, Jessup, MD
17. **Evaluation of Formic Acid and Thymol for the Management of *Varroa destructor* in Colonies of the Honey Bee, *Apis mellifera*.**
Nicholas W. Calderone, Department of Entomology, Comstock Hall, Cornell University, Ithaca, NY
18. **Geographic and temporal distribution of Pierce's disease vectors in Virginia.**
Anna K. Wallingford and Douglas G. Pfeiffer, Virginia Tech, Blacksburg, VA
19. **Rynaxypyr™ (DPX-E2Y45) A Novel Anthranilic Diamide Insecticide for the Control of Pome Fruit Pests.**
Greg Hannig, Paula G. Marçon, 1090 Elkton Road, Newark, DE, Daniel W. Sherrod, 8295 Tournament Drive, Memphis, TN, and Frederick W. Marmor, 1090 Elkton Road, Newark, DE
20. **Rynaxypyr™ (DPX-E2Y45) A Novel Anthranilic Diamide Insecticide for the Control of Fruiting and Leafy Vegetable Pests.**
Rachel Cameron, Paula G. Marçon, 1090 Elkton Road, Newark, DE, Daniel W. Sherrod, 8295 Tournament Drive, Memphis, TN, and Frederick W. Marmor, 1090 Elkton Road, Newark, DE
21. **Rynaxypyr™ (DPX-E2Y45) Biological Attributes of a Novel Anthranilic Diamide Insecticide (Chlorantraniliprole).**
James D. Barry, Don G. Clagg, Molly E. Waddell, and Paula G. Marçon, 1090 Elkton Road, Newark, DE

Sunday Afternoon

22. **A revision of the genus *Probole* Herrich-Schaffer (Lepidoptera: Geometridae).**
Timothy J. Tomon, The Pennsylvania State University, Department of Entomology, University Park, PA
23. **The effects of imidacloprid on the green lacewing, *Chrysoperla carnea*, and the monarch butterfly, *Danaus plexippus*: implications for interiorscapes.**
Mary A. Rogers, Vera A. Krischik, and Luis A. Martin, University of Minnesota, MN

Sunday Afternoon

Student Oral Presentation Competition*

York

12:00-5:00

***See appendix C for abstracts of talks for this session**

Organizer and Moderator: Brian A. Nault, Department of Entomology, Cornell University, New York State Agricultural Experiment Station, Geneva, NY.

- 12:00 **Advantages of on-site weather information for better PMI estimation.**
Patricia L. Hunt¹, Ke Chung Kim¹, Dennis Calvin¹ and Joseph Russo². (1) Department of Entomology, Pennsylvania State University, University Park, PA; (2) ZedX, Inc., Bellefonte, PA.
- 12:12 **Effects on pathogenesis of developmental resistance to baculovirus in gypsy moth larvae.**
Jim R. McNeil, Diana Cox-Foster and Kelli Hoover, Department of Entomology, Pennsylvania State University; University Park, PA.
- 12:24 **Development and transmission of microbial fauna through the life history of the Asian longhorned beetle (*Anoplophora glabripennis*).**
Scott M. Geib and Kelli Hoover, Department of Entomology, Pennsylvania State University, University Park, PA.
- 12:36 **More than muck munchers: Detritivores mediate predator herbivore interactions.**
Jessica E. Hines and Robert F. Denno, Department of Entomology, University of Maryland, College Park, MD.
- 12:48 **Success after a bottleneck: Persistence of an introduced insect with low levels of genetic and phenotypic variation.**
Robert G. Ahern, Micheal J. Raupp and David J. Hawthorne, Department of Entomology, University of Maryland, College Park, MD.
- 1:00 **Ecological traits correlate with abundance in a riparian forest macrolepidopteran larval assemblage.**
Eric M. Lind and Pedro Barbosa, Department of Entomology, University of Maryland, College Park, MD.
- 1:12 **Genotypic divergences and constraints in host plant use by polyphagous macrolepidoptera.**
J. Gwen Shlichta and Pedro Barbosa, Department of Entomology, University of Maryland, College Park, MD.
- 1:24 **The influence of native plants on arthropod diversity.**
Ellery A. Vodraska¹, Douglas Tallamy², Paula M. Shrewsbury¹ and Michael J. Raupp¹. (1) Department of Entomology, University of Maryland, College Park, MD; (2) Department of Entomology and Wildlife Ecology, University of Delaware, Newark, DE.

Sunday Afternoon

- 1:36 **BREAK**
- 1:48 **Alternative food type mediates predator community structure and herbivore survival in a corn agroecosystem.**
Steven D. Frank, Paula M. Shrewsbury and Robert F. Denno, Department of Entomology, University of Maryland, College Park, MD.
- 2:00 **Floral-supplemented buffer strips as refuges for natural enemies: source or sink?**
Laura C Moore, Terry Patton, Amy Miller, Galen P. Dively and Robert F. Denno, Department of Entomology, University of Maryland, College Park, MD.
- 2:12 **Spatial and temporal dynamics of endemic entomopathogenic nematodes in annual bluegrass weevil (Coleoptera:Curculionidae) infested golf course turfgrass.**
Benjamin A. McGraw and Albrecht M Koppenhofer, Department of Entomology, Rutgers University, New Brunswick, NJ.
- 2:24 **Factors associated with local scale spread of pink hibiscus mealybug, (Hemiptera: Pseudococcidae).**
Justin Vitullo¹, Christopher Bergh², Aijun Zhang³ and Catharine Mannion⁴. (1) Department of Entomology, Virginia Polytechnic Institute and State University, Blacksburg, VA; (2) Virginia Polytechnic Institute and State University, Alson H. Smith, Jr. Agricultural Research and Extension Center, Winchester, VA; (3) Chemicals Affecting Insect Behavior Laboratory, USDA, Agriculture Research Service, Beltsville, MD; (4) Department of Entomology, University of Florida, Tropical Research and Education Center, Homestead, FL.
- 2:36 **Spatial factors associated with the initiation and spread of dogwood borer infestation in newly planted apple orchards.**
Daniel L. Frank¹, Tracy C Leskey² and Chris Bergh³. (1) Department of Entomology, Virginia Polytechnic Institute and State University, Blacksburg, VA; (2) USDA, Appalachian Fruit Research Station, Kearneysville, WV; (3) Virginia Polytechnic Institute and State University, Alson H. Smith Jr. Agricultural Research and Extension Center, Winchester, VA.
- 2:48 **Dispersal behavior of neonate European corn borer, *Ostrinia nubilalis* Lepidoptera: Crambidae, on transgenic Bt corn.**
Jessica A Goldstein¹, Charles Mason¹ and John Pesek². (1) Entomology and Wildlife Ecology, University of Delaware, Newark, DE; (2) Food and Resource Economics, University of Delaware, Newark, DE.
- 3:00 **Potential of a pheromone based attract-and-kill strategy to improve management of strawberry sap beetle (Coleoptera: Nitidulidae).**
Rebecca L. Loughner and Gregory M. Loeb, Department of Entomology, Cornell University, New York State Agricultural Experiment Station, Geneva, NY.

Sunday Afternoon

- 3:12 **BREAK**
- 3:24 **Diversity of rhizobial plant symbionts influences soybean aphid populations.**
Jennifer M. Dean and Consuelo M. De Moraes, Department of Entomology,
 Pennsylvania State University, University Park, PA.
- 3:36 **Evaluating the impact of plant-growth-promoting-rhizobacteria and natural enemies on *Myzus persicae* infestations in pepper.**
Caroline Boutard and Brian A. Nault, Department of Entomology, Cornell University,
 New York State Agricultural Experiment Station, Geneva, NY.
- 3:48 **Evidence of an aggregative oviposition behavior for viburnum leaf beetle, *Pyrrhalta viburni* (Paykull), and potential benefits and costs associated.**
Gaylord A Desurmont and Paul A. Weston, Department of Entomology, Cornell
 University, Ithaca, NY.
- 4:00 **Effect of bean leaf beetle feeding injury on early-growth stage snap beans.**
Meredith E. Cassell¹ and Thomas P. Kuhar². (1) Department of Entomology, Virginia
 Polytechnic Institute and State University, Blacksburg, VA. (2) Virginia Polytechnic
 Institute and State University, Eastern Shore Agricultural Research and Extension Center,
 Painter, VA.
- 4:12 **Evaluation of fall soil sampling for predicting spring infestation of secondary soil pests in corn.**
Timothy A. Jordan¹, Roger R. Youngman¹, Curt A. Laub¹, Thomas P. Kuhar² and
 Siddharth Tiwari¹. (1) Department of Entomology, Virginia Polytechnic Institute and
 State University, Blacksburg, VA; (2) Virginia Polytechnic Institute and State University,
 Eastern Shore Agricultural Research and Extension Center, Painter, VA.
- 4:24 **Survey of European natural enemies of swallow-worts (*Vincetoxicum* spp.).**
Aaron S. Weed¹, Richard A. Casagrande¹ and André Gassmann². (1) Department of Plant
 Sciences, Biological Control Laboratory, University of Rhode Island, Kingston, RI; (2)
 CABI Switzerland Centre, Delémont, Switzerland.
- 4:36 **Residual toxicity of imidacloprid treated cotoneasters to hawthorn lace bugs: a field and greenhouse study.**
Adrianna Szczepaniec and Michael J. Raupp, Department of Entomology, University of
 Maryland, College Park, MD.
- 4:48 **Efficacy of microwave irradiation for the eradication of pine engraver beetles in red pine logs.**
Maya E. Nehme¹, Kelli Hoover¹, John Janowiak² and Jeffrey Kimmel². (1) Department
 of Entomology, Pennsylvania State University, University Park, PA; (2) School of Forest
 Resources, Pennsylvania State University, University Park, PA.
- 5:00 **Adjourn**

Sunday Evening

National ESA President's Address to the Branch Membership	<i>York</i>	5:30-6:00
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Scott H. Hutchins, ESA President
"ESA: Renewal and Refocus"

EB ESA President's Reception	<i>Carlisle</i>	6:00-7:30
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Art Agnello, EB ESA President

Author's attendance at posters	<i>Carlisle</i>	6:00-7:30
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IDEP Workshop	<i>Carlisle</i>	6:00-7:30
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"Exotic Pest Show and Tell"

Organizers: Jim Stimmel, PA Dept. of Agriculture and Dick Bean, MD Dept. of Agriculture

IDEP Committee Meeting	<i>TBA</i>	TBA
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Student Networking Social	<i>Leland</i>	7:30-9:00
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Organizer: Art Agnello, Eastern Branch President

MONDAY MARCH 19, 2007**Monday Morning**

Registration	<i>Lancaster Lobby</i>	8:00-5:00
Mark Taylor, Maryland Dept. of Agriculture		
Local Arrangements	<i>New Governor</i>	8a.m.-9p.m.
Greg Krawczyk, Pennsylvania State University		
Posters and Displays	<i>Carlisle</i>	8:00-5:00

IDEP Symposium	<i>Lancaster</i>	8:00-12:00
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“Status Updates on Invasive Insects of Concern in the Northeast”

Organizers: Dick Bean, MD Dept. of Agriculture and Jim Stimmel, PA Dept. of Agriculture

- 8:00 **Welcome and Introduction.** Dick Bean, MD Department of Agriculture
- 8:04 **Asian longhorned beetle: New Jersey eradication program.** Barry Emens, NJ ALB eradication coordinator, USDA-APHIS-PPQ
- 8:30 ***Sirex noctilio*: Perspectives for its biocontrol in the Northeast.** David Williams, Entomologist, USDA-APHIS-PPQ, Otis ANGB, MA
- 8:56 ***Halyomorpha halys*: Damage potential and range extension.** Anne Nielsen, Dept. of Entomology, Rutgers University
- 9:22 **European crane fly: An emerging pest of turf.** Daniel Peck, Entomologist, NYSAES, Geneva, NY
- 9:48 **Swede midge: Damage, survey methods, and distribution.** Christine Hoepting, Vegetable specialist, Cornell Univ., Albion, NY
- 10:14 **Africanized honeybees: Insuring the free movement of bees in the age of Africanized honeybees.** Dennis vanEnglesdorp, Acting State Apiarist, PA Dept. of Agriculture
- 10:40 **Euonymus leaf notcher: Current situation.** Eric Day, Dept. of Entomology, Virginia Tech
- 11:06 **Viburnum leaf beetle: Current situation.** Paul Weston, Dept. of Entomology, Cornell Univ., Ithaca, NY
- 11:32 **Emerald ash borer: Maryland’s situation.** Dick Bean, Entomologist, Maryland Dept. of Agriculture

Monday Morning

Field Crops Symposium

York

8:00-11:00

“Northeast Regional Field Crops Insect Conference”

Organizer: Ames Herbert, Virginia Tech, Suffolk, VA

- 8:00 **Introduction.** Ames Herbert, Virginia Tech, Suffolk, VA
- 8:10 **Soybean seed treatment update.** Joanne Whalen, University of Delaware, Newark, DE
- 8:30 **Can riparian grass buffers enhance natural enemy communities in field crops?**
Galen Dively, University of Maryland, College Park, MD
- 8:50 **Management of hunting billbug in orchardgrass under intensive hay production.**
Roger Youngman and Curt Laub, Virginia Tech, Blacksburg, VA; Kenner Love, Virginia
Cooperative Extension, Rappahannock Co., VA; and Timothy Mize, Virginia
Cooperative Extension, Fauquier Co., VA
- 9:10 **Development of a comprehensive research and educational approach to managing
leaf-damaging pests of soybean.** Sean Malone, Ames Herbert, and David Holshouser,
Virginia Tech, Suffolk, VA.
- 9:30 **BREAK**
- 9:40 **Epigeal coleopteran biodiversity and dynamics in northeastern agroecosystems:
transgenic and landscape effects.** Timothy Leslie, Chris Mullin, Dave Biddinger, Jason
Rohr, and Shelby Fleischer, Penn State, University Park, PA; and Gwen-Alyn Hoheisel,
Washington State University, Prosser, WA
- 10:00 **Corn earworm susceptibility to pyrethroids: contrasting geographic regions.** Shelby
Fleischer and Timothy Leslie, Penn State, University Park, PA; and William Hutchison,
University of Minnesota, St. Paul, MN
- 10:20 **Corn earworm: VA advisory and update on pyrethroid resistance monitoring and
field efficacy trials in soybean.** Ames Herbert and Sean Malone, Virginia Tech,
Suffolk, VA.
- 10:40 **General discussion**
- 11:00 **Adjourn**

Monday Morning

Industry Symposium

Gettysburg

8:00-12:00

“Emerging Pest Management Issues in Specialty Markets: Urban, Home and Garden, Public Health”

Organizer: Thomas Anderson, FMC Corporation, Princeton, NJ

- 8:00 **Welcome and Introduction.** Thomas E. Anderson, FMC Corp.
- 8:15 **New Approaches to Household Pest Management.** Dina Richman, FMC Corp.
- 8:40 **Innovative Solutions to New, Old, and Recurring Pest Problems in Non-Crop Markets.** Marc Fisher, Matt Messenger, Dan Jenkins, Paul Borth. Dow Agrosiences.
- 9:05 **New Chemistry from DuPont Professional Products for Urban Pest Management and Turf and Ornamentals Markets.** Mark A. Coffelt, DuPont Professional Products.
- 9:30 **Bed Bugs: Challenges, Obstacles, and Solutions.** Rick Cooper, Cooper Pest Solutions.
- 9:55 **BREAK**
- 10:10 **The Brown Marmorated Stink Bug: A New Pest Rears Its Head and Homeowners Don’t Like It!** Christopher Arne, Rentokil Ehrlich.
- 10:35 **Over the Counter Consumer Pest Management Solutions for Turf and Ornamentals.** Ramni Soufi, Scotts, Inc.
- 11:00 **Emerging Pest Management Issues in Specialty Markets: Urban, Home and Garden, Public Health.** Paul Hardy, Orkin Pest Control.
- 11:25 **Panel Discussion and Wrap-Up.** Thomas Anderson, Moderator, with all speakers.
- Noon **Invited Speakers Luncheon**

Monday Afternoon

Ornamentals and Turf Symposium

Lancaster

1:00-5:00

“What’s New in Pests and Pest Management in the Northeast Region”

Organizers: Daniel Gilrein, Cornell Cooperative Extension of Suffolk County, Riverhead, NY, and
Mark Taylor, Maryland Department of Agriculture

- 1:00 **Introduction and welcome.** Daniel Gilrein, Cornell Cooperative Extension
- 1:05 **Slugs and snails.** David Robinson, Malacology Identification Specialist, USDA APHIS-PPQ, Academy of Natural Sciences, Philadelphia
- 1:50 **Managing the oriental beetle (Coleoptera: Scarabaeidae) in nurseries using mating disruption.** Valerie Fournier, Postdoctoral Associate, Department of Entomology, Rutgers University
- 2:20 **IPM Technique for Nurseries: Subjecting Nursery Plant Cuttings to Hot Water Treatments as a Non-Chemical Control of Insects and Mites.** Stanton Gill, Regional Extension Specialist, IPM for Nursery & Greenhouse Management, Central Maryland REC, University of Maryland and Professor, Montgomery College, Landscape Technology Program
- 2:50 **BREAK**
- 3:00 **Winter Moth (Lepidoptera: Geometridae) Outbreak in New England.** Joe Elkinton, Division of Entomology, Dept. of Plant Soil and Insect Science, Univ. of Massachusetts
- 3:30 **The tobacco aphid (Hemiptera: Aphididae), as a potential problem on ornamental plants.** Paul Semtner, Extension Entomologist, Southern Piedmont AREC, Virginia Tech, Blackstone, VA
- 4:00 **The hunter fly (Diptera: Muscidae), a 'new' predator for fungus gnats, shoreflies and other greenhouse pests.** Todd Ugine, Postdoctoral Associate, Dept. of Entomology, Cornell University
- 4:30 **Observations from the Diagnostic Lab: Pest Problems of Ornamental Plants.** Carolyn Klass, Sr. Extension Associate, Dept. of Entomology, Cornell University
- 5:00 **Adjourn**

Monday Afternoon

Student Symposium

James Monroe

1:00-4:00

“Taxonomy and Phylogenetics in the Modern Scientific Community”

Organizer: Anne Nielsen. Entomology Department, Rutgers University, New Brunswick, NJ

- 1:00 **Introduction.** Anne Nielsen. Entomology Department, Rutgers University, New Brunswick, NJ
- 1:05 **Phylogeny of robber flies (Diptera: Asilidae) – total evidence and parsimony.** Torsten Ditkow, Department of Entomology, Cornell University, Ithaca, NY
- 1:30 **Phylogeny of the higher Libelluloidea (Anisoptera: Odonata): an exploration of the most speciose superfamily of dragonflies.** Jessica Ware. Entomology Department, Rutgers University, New Brunswick, NJ
- 1:55 **Climbing trees: Ecological and morphological trends in the water scavenger beetles (Coleoptera: Hydrophilidae).** Andrew Short, Department of Entomology, Cornell University, Ithaca, NY
- 2:20 **Reticulate phylogenies in insects? Hybrid speciation as an origin for insect diversity.** Dietmar Schwarz, Department of Entomology, Pennsylvania State University, University Park, PA
- 2:45 **BREAK**
- 2:55 **Prospecting for diversity: Detecting recent divergence by high-resolution genotyping.** Rob Ahern, Department of Entomology, University of Maryland, College Park, MD
- 3:20 **Temperature impact over invasive species biology, *Aphis glycines*.** Wilma Aponte-Cordero, Department of Entomology, Pennsylvania State University, University Park, PA
- 3:45 **Concluding remarks and discussion**
- 4:00 **Adjourn**

Monday Afternoon

Fruit Symposium*

Gettysburg

1:00-5:00

“The Changing Environment of Horticultural Entomology: Research on New Solutions to Pest Problems of Tree Fruits and Small Fruits”

Organizer: Clayton T. Myers, Research Entomologist, USDA-ARS Appalachian Fruit Research Station, Kearneysville, WV

***See appendix D for abstracts of talks for this session**

- 1:00 Introduction**
- 1:05 New approaches for identification and application of olfactory attractants for the plum curculio.** Tracy C. Leskey, USDA-ARS, Appalachian Fruit Research Station, Kearneysville WV; A. Zhang, USDA-ARS, BARC, Chemicals Affecting Insect Behavior Laboratory, Beltsville MD; G. Chouinard, IRDA, St. Hyacinthe, Quebec; and D. Cormier, IRDA, St. Hyacinthe, Quebec.
- 1:26 Semiochemical-based management of blueberry pests.** Cesar Rodriguez-Saona, Rutgers University, P.E. Marucci Blueberry/Cranberry Research and Extension Center. Chatsworth, NJ.
- 1:47 Attraction of grape root borer neonates to root extracts in laboratory bioassays.** J.Christopher Bergh, Virginia Tech, Agricultural Research and Extension Center, Winchester, VA and J.R. Meyer, North Carolina State University, Dept. of Entomology, Raleigh, NC.
- 2:08 Evaluation of potential products for organic control of apple maggot.** W. Harvey Reissig, D. Combs, and C. Smith., Entomology Dept., NYSAES, Geneva, NY.
- 2:29 Insect pest control in organic apple orchards in Pennsylvania.** Greg Krawczyk, and L. A. Hull, Penn State University Fruit Research and Extension Center, Biglerville, PA.
- 2:50 BREAK**
- 3:05 Apples even a bug couldn't love: the search for host-plant resistance in Malus.** Clayton T. Myers, USDA-ARS, Appalachian Fruit Research Station, Kearneysville, WV, W. H. Reissig, Cornell University, New York State Agricultural Experiment Station, Geneva, NY, and P. L. Forsline, USDA-ARS, Plant Genetic Resources Unit, Geneva, NY.
- 3:26 The integration of a baculovirus and pheromone mating disruption to manage codling moth and oriental fruit moth in Pennsylvania apple orchards.** Larry A. Hull, Penn State University Fruit Research and Extension Center, Biglerville, PA.

Monday Afternoon

- 3:47 **Conservation biological control of aphids in apple orchards.** Mark W. Brown, USDA-ARS, Appalachian Fruit Research Station, Kearneysville, WV, and C. R. Mathews, Institute for Environmental Studies, Shepherd University, Shepherdstown, WV.
- 4:08 **Conservation biological control in apple and peach orchards.** David J. Biddinger. Penn State University Fruit Research and Extension Center, Biglerville, PA.
- 4:29 **The new economic environment: incentive payments, crop insurance and green marketing.** Ed Rajotte, Professor of Entomology and PA IPM Coordinator. Penn State University Department of Entomology, University Park, PA.
- 4:45 **General Discussion**
- 5:00 **Adjourn**
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Monday Evening

Social gathering and cash bar	<i>Carlisle</i>	5:30-6:00
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Banquet and Awards	<i>York/Lebanon</i>	6:00-8:30
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ESA Entomological Foundation Award for Excellence in Integrated Pest Management
 Eastern Branch Herbert T. Streu Meritorious Service Award
 L.O. Howard Distinguished Achievement Award
 Asa Fitch Award
 John Henry Comstock Award
 Student Oral and Poster Competition Awards

Banquet Speaker:

Shelby Fleischer, Professor, Department of Entomology, Pennsylvania State University
 Presentation title: "*Blue collar entomology: life at the pyramid's apex*"

Linnaean Games	<i>Lancaster</i>	9:00
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Organizer: Doug Pfeiffer, Moderator

Tuesday March 20, 2007**Tuesday Morning**

Eastern Branch Business Meeting	<i>Lebanon</i>	7:00-7:45
Registration Mark Taylor, Maryland Dept. of Agriculture	<i>Lancaster Lobby</i>	8:00-10:00
Local Arrangements Greg Krawczyk, Pennsylvania State University	<i>New Governor</i>	8:00-11:00
Posters and Displays	<i>Carlisle</i>	8:00-12:00

Biological Control Symposium*	<i>Lancaster</i>	8:00-12:10
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Weed Biological Control Update

Organizers: Richard Casagrande, University of Rhode Island, Kingston, RI, and
Roger W. Fuester, USDA-ARS, Newark, DE

***See appendix E for abstracts of talks for this session**

- 8:00 **Opening remarks**
Richard Casagrande, University of Rhode Island
- 8:05 **Dispersal and Impact of the Mile-a-Minute Weevil.** Ellen Lake and Judy Hough-Goldstein, University of Delaware, Newark, DE
- 8:45 **Update on Biological Control of Kudzu.** Matthew J. Frye and Judy Hough-Goldstein, University of Delaware, Newark, DE
- 8:55 **Biological Control of *Phragmites*.** Richard Casagrande, University of Rhode Island, Kingston, RI
- 9:20 **Biological Control of Swallow-Worts.** Aaron Weed and Richard Casagrande, University of Rhode Island, Kingston, RI , A. Gassmann, CABI Switzerland Centre, Delémont, Switzerland
- 9:45 **Initiating a Biological Control Program for *Ailanthus altissima* (tree-of-heaven) in Virginia.** Kok, L. T., Salom, S. M., Yan, S., McAvoy, T. J., and Herrick, N.J., Virginia Tech, Blacksburg, VA

10:10 **BREAK**

Tuesday Morning

10:25 **Genetics of Herbivore Host Specificity: Implications for Biological Control of Weeds.** Keith Hopper, USDA-ARS, Newark, DE

10:50 **“Intelligent Design” on a new approach to weed BC.** Richard Casagrande, University of Rhode Island, Kingston, RI

11:15 **Biocontrol Briefs.** Open Microphone (5 min. max)

11:55 **Closing remarks.**
Roger Fuester, USDA-ARS

New Pesticide Discoveries Symposium

York

8:00-12:00

"The Impact of New Pesticides and Regulatory Changes on Pest Management in Vegetable and Fruit Crops"

Organizers: Tom Kuhar, Virginia Tech Eastern Shore AREC, Painter, VA and
Brian Nault, NYSAES, Cornell University, Geneva, NY

8:00 **Introduction.** Tom Kuhar, Virginia Tech Eastern Shore AREC, Painter, VA

8:10 **Seed treatments for vegetable insect pest management - challenges in registration and opportunities for use.** Brian Nault, NYSAES, Cornell University, Geneva, NY

8:35 **Impact of new pesticides and regulatory changes on fruit crops in the Mid-Atlantic states.** Peter Shearer, Rutgers University, Rutgers Agricultural Research & Extension Center, Bridgeton, NJ and Larry A. Hull, Pennsylvania State University, Fruit Research & Extension Center, Biglerville, PA

9:00 **New miticides for fruit, vegetable, and ornamental crops.** Daniel Gilrein, Cornell Cooperative Extension, Long Island, NY

9:25 **Alverde, a new insecticide technology for lepidoptera and beetle control in potatoes and vegetables.** Steve Broschious, Gar Thomas, and Glenn Oliver, BASF Corporation, Research Triangle Park, NC

9:45 **BREAK**

10:00 **Introducing Altacor and Coragen, two new insecticide products from Dupont for vegetable and fruit crops.** Donald Ganske, DuPont Crop Protection, Winchester, VA

Tuesday Morning

- 10:20 **The Registration and use of Spinetoram in eastern U.S. tree fruit and vegetable crops.** Brian Olson, Jim Dripps, Randy Huckaba, and Tony Weiss, Dow AgroSciences LLC, Indianapolis, IN
- 10:40 **Flubendiamide, the next generation in lepidoptera pest management.** Matthew J. Mahoney and Shane Hand, Bayer CropScience, Research Triangle Park, NC
- 11:00 **MOVENTO®, a new broad-spectrum insecticide for sucking insect pest control.** Matthew J. Mahoney, S. Krueger, R. Steffens, J. Bell, Bayer CropScience, Research Triangle Park, NC
- 11:20 **General discussion**
- 12:00 **Adjourn**
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Submitted Papers

Gettysburg

8:00-12:00

Moderators: William Lamp, University of MD and Douglas Tallamy, University of DE

***See appendix F for abstracts of talks for this session**

- 8:00 **The effect of Bt corn on the male mating success of the Western corn rootworm, *Diabrotica virgifera virgifera*.** Thomas G. Bentley, Biology Department, University of Delaware, Newark, DE, Douglas W. Tallamy, Entomology and Wildlife Ecology, University of Delaware, Newark, DE, and Bruce Hibbard, Department of Entomology, University of Missouri, Columbia, MO
- 8:12 **"Is male quality a self-referenced trait in spotted cucumber beetles, *Diabrotica undecimpunctata howardi*?"** Jared G. Ali, Landenberg, PA, and Douglas Tallamy, Entomology and Wildlife Ecology, University of Delaware, Newark, DE
- 8:24 **Investigations in the influence of plant leaf area and height on European corn borer oviposition.** Katie A. Ellis and Dennis D. Calvin, Penn State University, University Park, PA
- 8:36 **Evaluation of Screen Bottom Boards for the Management of *Varroa destructor* in Colonies of the Honey Bee, *Apis mellifera*.** Nicholas W. Calderone, Department of Entomology, Cornell University; Ithaca, NY

- 8:48 **Spatial and temporal interactions between corn leaf aphids (Hemiptera:Aphidae) and lady beetles (Coleoptera: Coccinellidae).** Yong-Lak Park, Plant and Soil Sciences, West Virginia University, Morgantown, WV

Tuesday Morning

- 9:00 **Overwintering strategies of the entomopathogenic nematodes *Steinernema scarabaei* and *Heterorhabditis bacteriophora* in relation to their white grub hosts.** Daniel E. Elmowitz and Albrecht M. Koppenhöfer, Dept. Entomology, Rutgers University, New Brunswick, NJ,
- 9:12 **Do bugs and beetles avoid plants treated with neonicotinoid pesticides?** Kate L. Laskowski, Josh L. Wood, and Michael J. Raupp, University of Maryland, College Park, MD
- 9:24 **Breaking all the rules: possible effects of a neonicotinoid insecticide on host selection behavior by cranberry weevil.** Anne L Averill, Department Plant, Soil and Insect Sciences, University of Massachusetts, Amherst, MA .
- 9:36 **QRD 400, A Novel Plant Extract for Plant Insect and Mite Pest Management.** H. Brett Highland, AgraQuest, Inc., Nokomis, FL., Paul Walgenbach and Helene Chiasson, AgraQuest, Inc., Davis, CA.
- 9:48 **BREAK**
- 10:00 **Response of a native and introduced legume to feeding injury of the native potato leafhopper.** William O. Lamp, Department of Entomology, University of Maryland; College Park, MD, and Nofisat Sonekan, Science and Technology Center; Eleanor Roosevelt High School, Greenbelt, MD
- 10:12 **Does the scale of an alien plant invasion affect native insect communities?** Erin B. Reed and Douglas W. Tallamy, Entomology and Wildlife Ecology; University of Delaware, Newark, DE
- 10:24 **Effect of landscaping with native plants on breeding bird diversity and abundance.** Karin T. Burghardt and Douglas W. Tallamy, Entomology and Wildlife Ecology, University of Delaware, Newark, DE
- 10:36 **Lepidopteran Use of Native and Alien Ornamental Plants.** Douglas W. Tallamy and Kimberley J. Shropshire, Entomology and Wildlife Ecology; University of Delaware, Newark, DE
- 10:48 **Comparison of aquatic insect communities between adjacent headwater and main-stem streams in urban and rural watersheds.** Robert F. Smith and William O. Lamp, University of Maryland, Dept. of Entomology, College Park, MD

- 11:00 **The larvae of *Miocova peraltica* Calvert with comparison to other Polythorid larvae and molecular species assignment (Zygoptera: Polythoridae).** Diana Carle, Department of Entomology, Rutgers University, New Brunswick, NJ.

Tuesday Morning

- 11:12 **Liquid detection and consumption in the caterpillar *Manduca sexta*.** Da Shi, Baltimore, MD, Marc Rowley, Berea, KY, and Frank Hanson, Department of Biological Sciences, University of Maryland Baltimore County, MD
- 11:24 **Crowding in early life causes deformities in insects.** Christopher Wells, Alex Bohorquez, and Frank Hanson, Department of Biological Sciences, University of Maryland Baltimore County, MD
- 11:36 **Using the 50% Formic Acid Fumigator to control Varroa mites in Florida, 2006.** Jim Amrine, Division of Plant / Soil Sciences, West Virginia University, Morgantown, WV, Bob Noel, Beekeeper, Cumberland, MD, and David Webb, Florida State Beekeepers Association, Cocoa, FL
- 11:48 **Adjourn**

Meeting Adjourned

12:00

APPENDIX A

Student Poster Competition Abstracts

1. Bionomics of *Ochlerotatus canadensis* in southwest Virginia, and the simultaneous survey for La Crosse virus

Nancy M. Troyano and Sally L. Paulson, Department of Entomology, Virginia Polytechnic Institute and State University, Blacksburg, VA.

Ochlerotatus canadensis has been shown to vector La Crosse Virus (LAC) (the leading cause of pediatric encephalitis in the U.S.). A study conducted in the New River Valley, VA, in 2002 revealed a LAC positive pool of nine field collected *Oc. canadensis* in this area. This suggests that *Oc. canadensis* may be a significant contributor to the rising number of LAC cases in southwest Virginia. In 2006 a study was conducted to determine both the bionomics and prevalence of La Crosse virus in *Oc. canadensis* in the New River Valley. Three collection sites were established, each with slight ecological variations. All contained permanent or semi permanent pools with varying sizes. Pools were surveyed for larvae between March and June, and again from mid-September to early December. The number of larvae peaked from late April to mid-May, depending on pool size. Adult sampling was conducted in mid-June and continued through late August, but very few adults were collected throughout the sampling period. A total of 833 *Oc. canadensis* were collected and assayed for LAC virus via plaque assays. All plaque assays were negative. These negative tests may be a result of an early season collection in 2006, in contrast to a late season collection in 2002.

2. Large-scale spatial variation in community composition: Local and latitudinal changes in salt marsh food webs

Jessica E. Hines and Robert F. Denno, Department of Entomology, College Park, MD.

Classic biogeography theory states that species diversity and consumer pressure increases at lower latitudes. However, very few studies have examined multi-trophic patterns in community composition across latitudinal gradients. Recent studies have found salt marsh soil microbial communities, responsible for decomposition of leaf litter and mineralization of litter nitrogen, vary across latitudinal gradients, and that southern marsh plants are better defended and less palatable than their northern conspecifics. Because the spatial distribution of herbivorous insects and their arthropod predators are strongly linked to nutrient availability and vegetation structure we hypothesize that herbivorous insect community composition will change across a latitudinal gradient as well. We examined the distribution of insect herbivores and their predators across an elevation gradient from the high marsh to the low marsh in 13 sites ranging in latitude from 43° 20' (Wells, ME) to 31° 05' (Jekyll Island, GA). We found that there were no distinct patterns in abundance of sap-feeding herbivores across the latitudinal gradient. However, predatory spiders were more abundant on northern marshes where there was also increased vegetation complexity and decreased abundance of grazing snails. Our results suggest that across a latitudinal gradient there may be a shift in the relative importance of predation and plant quality in influencing herbivore abundance.

3. **Spatio-temporal prediction of temperature-dependent diapause termination of Japanese hornfaced bee (Hymenoptera: Megachilidae) adults in West Virginia**

Joseph B. White and Yong-Lak Park, Department of Entomology, Division of Plant and Soil Sciences, West Virginia University, Morgantown, WV.

Japanese hornfaced bees, *Osmia cornifrons* (Radoszkowski), are key pollinators of spring blooming crops such as apple, pear and blueberry. To maximize pollination of the target plant, diapause termination of overwintering hornfaced bee adults must be synchronized with the bloom of the target crop. This study was conducted to spatially and temporally predict diapause termination of Japanese hornfaced bees in West Virginia by modeling temperature-dependent diapause termination patterns. Overwintering hornfaced bee adults were placed at constant temperatures of 15, 20, 25, 30, and 35 degree C. The number of adults that terminated diapause was counted daily and diapause termination patterns were modeled with nonlinear temperature-dependent models (i.e., Logan's model and Wagner's model). The models provide the lowest temperature and required thermal units to terminate adult diapause. Then, a geographic information system (GIS) was used to spatially and temporally predict the diapause termination of adults in West Virginia based on temperature data collected throughout West Virginia. GIS provides probability maps for diapause termination of hornfaced bee adults at any given time in West Virginia. Target plant phenology maps were produced based on degree-day models and overlaid with the diapause termination map for the hornfaced bee. When maps of hornfaced bee and plant phenology were overlaid it was possible to predict the spatial and temporal placement of the hornfaced bee. This study showed that diapause termination could be manipulated to achieve spatial and temporal synchronization of the hornfaced bee diapause termination with the target plant blooming.

4. **Differences in ground arthropod diversity in three different tillage systems of flue-cured tobacco**

Lakshmipathi Srigiriraju¹, Paul J Semtner² and David T Reed². (1) Department of Entomology, Virginia Polytechnic Institute and State University, Blacksburg, VA; (2) Virginia Polytechnic Institute and State University, Southern Piedmont Agricultural Research and Extension Center, Blackstone, VA.

Studies were under progress at Virginia Tech, Southern Piedmont AREC, Blackstone, VA to evaluate the impact of tillage system, insecticide application and cover type on the abundance of ground inhabiting arthropods in flue-cured tobacco. The three types of tillage systems were plowed, strip till and no-till planting each followed by moderate cultivation at 4th wk after transplanting. The insect management practices included (1) treatment with an organophosphate (Acephate - Orthene®) as a transplant water treatment and the same used for the control of lepidopteran pests (2) a neo-nicotinoid (Imidacloprid - Admire® for sucking pest and Spinosad - Tracer® for lepidopteran pest control) compared to the chemical free treatment (control). The tests were conducted in two different cover crops, wheat and sorghum. The experiment was laid out in a Latin Square design, and replicated four times to minimize possible habitat heterogeneity. Pitfall trap sampling was carried out starting a week after transplanting (May 2004). Two standard pit-fall traps (= one trap, Martin 1977) part filled with 50 ml of preservative (ethylene glycol + 50% Ethanol) were placed per plot for sampling the ground inhabiting arthropods. These series of pitfall trap sampling will be carried out for 16 weeks, till the harvest

period. Specimens will be sorted to the order level and the data would be analyzed to compare the differences in species richness, relative abundance and species density, proportion of each species and their dominance between treatments and the two cover crop types respectively.

5. The aphid species composition in Central Pennsylvanian snap-bean fields, including *Aphis glycines*

Amanda C. Bachmann¹, William Sackett², Thomas Butzler³, Fredrick E. Gildow² and Shelby J. Fleischer¹. (1) Department of Entomology, Pennsylvania State University, University Park, PA; (2) Department of Plant Pathology, Pennsylvania State University, University Park, PA; (3) Clinton County Cooperative Extension, Pennsylvania State University, Mill Hall, PA.

Aphids can vector cucumber mosaic virus (CMV), which causes serious damage to many crops. Snap-bean crops in Pennsylvania began to show CMV-like symptoms in 2003, which coincided with the appearance of *Aphis glycines*, the soybean aphid. We investigated the species composition of aphids in snap bean fields along a valley transect in central Pennsylvania and related that to the transmission efficiency of the most prevalent species. Species composition was determined by trapping aphids in six fields in Centre County over a 3 year period. The soybean aphid was one of the more prevalent species, and is an efficient vector of CMV. To further understand the lifecycle of the soybean aphid in Pennsylvania we estimated the prevalence of its primary host, *Rhamnus cathartica* (common buckthorn), in the wooded areas surrounding the valley.

6. Stink bug (Heteroptera: Pentatomidae) egg parasitoids and apparent host preference in southeast Virginia

Amanda L. Koppel¹, Ames Herbert² and Thomas Kuhar³. (1) Department of Entomology, Virginia Polytechnic Institute and State University, Blacksburg, VA; (2) Virginia Polytechnic Institute and State University, Tidewater Agricultural Research and Extension Center, Suffolk, VA; (3) Virginia Polytechnic Institute and State University, Eastern Shore Agricultural Research and Extension Center, Painter, VA.

Species complex surveys and parasitism rate studies of stink bug natural enemies have been conducted in many areas, including the southern United States and Brazil, but none have been conducted in Virginia. A survey of stink bug egg parasitoids was conducted in the 2005 and 2006 field seasons (May to August) in wheat, soybean and several vegetables by collecting egg masses and by monitoring sentinel egg masses. A total of 752 *Euschistus servus*, *Murgantia histrionica*, *Podisus maculiventris*, and *Acrosternum hilare* eggs were field collected and returned to the laboratory where emerging parasitoids were identified to species. In addition, 1,525 sentinel lab-reared *E. servus* eggs, and 230 *P. maculiventris* eggs from a commercial vendor were placed into crop fields. Individual masses were attached to plant stems or leaves and returned to the laboratory after 7 days, where parasitoid or stink bug emergence was recorded, and emerging parasitoids were identified to species. All parasitoids, except one mymarid specimen, were of the family Scelionidae (Hymenoptera). Further, the parasitoids seemed to exhibit a host egg preference; *Telenomus podisi* parasitized the eggs of *E. servus*, and *Trissolcus basalis* was reared from *A. hilare* and *M. histrionica* eggs. In addition, *Trissolcus euschisti* and *Trissolcus edessae* emerged from *A. hilare* eggs. Parasitism rates were the highest in *E. servus*

with 62.7% and 45.8% of egg masses and individual eggs parasitized, respectively, followed by *A. hilare*, with 19.0% and 30.4% of egg masses and individual eggs parasitized, respectively.

7. Field and laboratory assays to measure efficacy of selected synthetic and organic insecticides on green and brown stink bug

Katherine L. Kamminga¹, Ames Herbert² and Thomas Kuhar³. (1) Department of Entomology, Virginia Polytechnic Institute and State University, Blacksburg, VA; (2) Virginia Polytechnic Institute and State University, Tidewater Agricultural Research and Extension Center, Suffolk, VA; (3) Virginia Polytechnic Institute and State University, Eastern Shore Agricultural Research and Extension Center, Painter, VA.

Little data exists comparing efficacy of synthetic and organic insecticides against stink bugs. Field efficacy trials were conducted with common synthetic (organophosphates, pyrethroids, carbamates, and neonicotinoids) and organic (spinosad, azadirachtin, and pyrethrum) insecticides. Trials were conducted in fields found to have a high incidence of stink bugs. Insecticides were applied as foliar broadcasts using a CO₂ pressurized backpack sprayer. The organophosphates were the most efficacious of the synthetics tested while no significant difference was found among the organics. Lab bioassays were conducted using field collected stink bugs. Once acclimated, healthy adults and nymphs, were placed individually into 60 by 15 millimeter Petri dishes. Bugs were randomly placed into treatment groups. Fresh green beans were thoroughly rinsed with tap water and air dried. Insecticides were mixed to recommended label rates in 500 milliliters of water in mason jars. Green beans were submerged into each insecticide for 30 seconds then removed and air-dried for 1 hour. Control beans were immersed in tap water. One-third of each treated bean was placed into a Petri dish containing one adult or nymph. After 72 hours bugs were determined to be alive, dead, or knocked down. For the organics mixed results were achieved with no insecticide outperforming the others. Some treatments resulted in significant mortality compared with the untreated control.

APPENDIX B

Poster Presentation Abstracts

8. Patterns of macroinvertebrate community development in constructed seasonal wetlands and a restored Delmarva Bay on a Maryland farm.

Lauren E. Culler, Michelle R. Haube, and William O. Lamp, 4112 Plant Sciences Bldg., Department of Entomology, University of Maryland, College Park, MD

The Jackson Lane restoration site provides a unique opportunity to study the development of macroinvertebrate communities in seasonal freshwater wetlands. In 2003, a degraded Delmarva bay wetland was restored at this site and approximately 20 wetland “cells” were created on the adjacent farm field. Since this restoration, we have conducted extensive physical, chemical, and biological monitoring of the restored Delmarva bay (known as Pasture Pond or PPD), nine of the constructed wetland cells, and an existing reference Delmarva bay (Jackson Lane Large or JLL). Macroinvertebrates in each wetland are sampled starting in March of each year and monthly thereafter as the hydroperiod of each cell allows. Pre-restoration samples from 2003 and post-restoration samples from 2004 and 2005 have been processed thus far. The restored Delmarva bay and each of the created wetland cells has been rapidly colonized by aquatic macroinvertebrates. The overall abundance and diversity of aquatic taxa found at the Jackson Lane site has increased since the restoration took place, and there has been a reduction in the number of taxa tolerant of degraded conditions. This monitoring, in association with other monitoring efforts at the Jackson Lane site, should help to determine the success of the restoration efforts, and provide guidance to improved wetland restoration efforts in the future.

12. Low levels of parasitism of brown marmorated stink bug in the eastern US by native parasitoids.

Kim A Hoelmer, USDA ARS BIIR, 501 S. Chapel St; Newark, DE, Anne L Nielsen, Rutgers University, Dept of Entomology, New Brunswick, NJ, Gary L Bernon, USDA APHIS, Otis ANGB, MA, George C. Hamilton, Rutgers University, Dept of Entomology, New Brunswick, NJ

The host range of the recently introduced brown marmorated stink bug, *Halyomorpha halys*, includes commercially important fruits in Asia, suggesting that there is significant potential for this invasive insect to become an important pest in North America. As part of an assessment of the potential for biological control of *H. halys* in the U.S., we have surveyed for parasitism of the stink bug in several mid-Atlantic states and found that levels of egg parasitism by indigenous parasitoids are very low. We are also investigating the impact of adult stink bug parasitism by tachinid flies. Given the low levels of egg parasitism in the eastern U.S., it will be worthwhile to investigate the diversity and impact of parasitoids of *H. halys* in Asia to identify candidates for possible importation to North America.

13. Habitat Identification, Restoration, And Repatriation Plan For The Eastern Regal Fritillary (*Speyeria idalia idalia*) To Landholdings Historically Occupied Within The Northeastern United States.

Virginia Tilden, Mark Swartz, David McNaughton, and Nick Hoffman, The Pennsylvania State University, Fort Indiantown Gap, PA, Joseph Hovis, Department of Military and Veterans Affairs, Fort Indiantown Gap, PA

The eastern regal fritillary butterfly (*Speyeria idalia idalia*) at The National Guard Training Center Fort Indiantown Gap (NGTC-FTIG) in Lebanon and Dauphin Counties, Pennsylvania is the only known viable population of this species remaining east of Indiana. This butterfly once found commonly throughout the northeast has declined drastically over the past 20 years, probably due to the loss of native, open grassy habitats. In an effort to conserve this rare butterfly, a large scale repatriation effort has been proposed to include multiple partners and intensive habitat restoration over many years. A preliminary effort was attempted at Gettysburg National Military Park (GNMP) in 2005 but was unsuccessful. A tiered approach over 2-3 years is planned for this effort and will consist of landholding identification and interagency and cooperative partnerships, habitat enhancement and restoration, multiple releases of wild and captive-reared regals, and monitoring for success and adaptive management. The Pennsylvania Army National Guard at NGTC-FTIG is currently identifying partners with agencies and conservation organizations that manage landholding with grasslands (with historical regal presence or county record) and are interested in taking part in this project.

15. Paternal age and season affect reproductive decisions in giant waterbugs, *Belostoma flumineum* Say.

Gena L Coffey and Scott L Kight, Department of Biology and Molecular Biology, Montclair State University; Montclair, NJ

Animals that provide care to offspring may be expected to change the magnitude of investment as the parent ages. Specifically, as future reproductive potential diminishes, parents are expected to invest more heavily in each successive brood. We tested this hypothesis by examining age-related egg abandonment behavior in giant waterbugs, *Belostoma flumineum* Say. Male waterbugs bear pads of eggs upon their hemelytra until hatching, but are occasionally observed discarding the pads before the eggs hatch. We predicted that the frequency of egg discarding would decrease as (a) males age or (b) males encounter environmental cues associated with diminishing reproductive opportunities. In North America, waterbugs emerge in late Summer and breed prior to the onset of Winter. Reproduction halts until Spring, whereupon mating resumes in concert with senescence and mortality. We demonstrated that egg discarding is significantly more common in the Fall breeding season than in the Spring. We also demonstrated that young males are significantly less likely to discard eggs if kept at cool ambient temperatures. It may be that cooler temperatures predict the onset of Winter and diminished likelihood of obtaining a replacement brood prior to the end of the Fall breeding season.

16. Diet-induced Feeding Behavior of *Manduca sexta*.

Will, C. Gretes, 9356 Spring Water Path, Jessup, MD

Larval *Manduca sexta* have long been considered oligophagous, but two major hypotheses have competed to describe the mechanism in which larvae gain their host-restricted feeding preferences. Larvae have been observed to be innately specific to solanaceous plants, possessing a strong preference for these plants as both 5th instars and unfed hatchlings. Larvae have also been described as facultative specialists, requiring feeding experience on solanaceous plants to induce their oligophagy. These two potential and contrasting origins of larval host plant preference have existed in the literature for the past 50 years. Here we propose novel assays and comparisons to reevaluate the feeding behavior of *M. sexta* in an attempt to identify whether larvae are innately oligophagous or whether their specificity on solanaceous plants requires prior feeding experience on these plants.

22. A revision of the genus *Probole* Herrich-Schaffer (Lepidoptera: Geometridae).

Timothy J. Tomon, The Pennsylvania State University, Department of Entomology, University Park, PA

Moths in the genus *Probole* are common in woodlands throughout much of the Nearctic Region. Transcontinental in Canada and northern plain states, its range extends from British Columbia to northern California and in every state east of the Mississippi River. Classification within the genus is historically problematic and authors since the 1850's have proposed a diversity of names, recognizing from one to four taxa. To resolve this uncertainty, this study used morphological, molecular, and developmental information to quantify patterns of variation and their relationship to sex, brood, and geographical distribution. Morphological study of museum specimens emphasized cuticular features of genitalia and wing patterns in both sexes. Developmental studies documented variation in larval morphology and F1 progeny from isofemale rearings of known morphological type on a variety of host plants. Molecular studies measured sequence divergence in the mitochondrial gene COI from various geographical regions, seasonal broods, and morphological types. Morphological and developmental studies demonstrate phenological patterns in maculation, the spring brood differing from subsequent broods when present. More than one morphological type were reared from isofemale cultures, thus not supporting hypotheses of more than one species. COI sequence data show relatively low intrageneric divergence (<2.8%) when compared to other closely related geometrid moths (>17.8%), and do not support recognition of more than one species. As a result of these findings, the genus *Probole* is treated as containing a single, highly variable species, *Probole amicarica* (Herrich-Schäffer), which exhibits within-population polymorphism, sexual dimorphism, and between-brood polyphenism, as well as being geographically polytypic.

APPENDIX C

Student Oral Presentation Competition Abstracts

12:00 Advantages of on-site weather information for better PMI estimation

Patricia L. Hunt¹, Ke Chung Kim¹, Dennis Calvin¹ and Joseph Russo². (1) Department of Entomology, Pennsylvania State University, University Park, PA; (2) ZedX, Inc., Bellefonte, PA.

In forensic entomology, PMI (Post Mortem Interval) estimation is based on insect development within a corpse and the ambient temperature regime experienced by both the larvae and the corpse. However, when presented with entomological evidence from a crime scene, larval specimens and photographs of the scene are most commonly available for examination by the forensic entomologist. Therefore, the forensic entomologist must estimate the ambient temperature regime experienced by the larvae in order to estimate the PMI. In most cases, the best estimation for the ambient temperature regime at the crime scene is the closest reporting ASOS (Automated Surface Observation Station) usually at the local airport, which can be several miles away. Sometimes, simple regression models can be used to account for the distance and difference in temperature between the airport and the crime scene, however, in most cases, this still includes a large amount of uncertainty into the PMI estimate. Microclimatological factors such as topography, ground cover, and the chemical breakdown processes of decomposition all play a role in altering the ambient temperature experienced by a corpse from the recorded temperatures at the weather stations. In this presentation, we will show the increased benefits of using site-specific temperature readings to increase the accuracy of PMI estimations.

12:12 Effects on pathogenesis of developmental resistance to baculovirus in gypsy moth larvae

Jim R. McNeil, Diana Cox-Foster and Kelli Hoover, Department of Entomology, Pennsylvania State University; University Park, PA.

Gypsy moth (*Lymantria dispar*) larvae show a 2 to 3-fold reduction in susceptibility to infection by the *Lymantria dispar* nucleopolyhedrovirus (LdNPV) in the middle of each instar. We hypothesize that this resistance is in part the result of age-related differences in immunoresponsiveness, particularly in the responses of hemocytes to virus particles or infected tissue. We inoculated insects of both susceptible- and resistant-aged larvae with a strain of LdNPV genetically modified to express a lacZ reporter gene. Larval cohorts were dissected and processed for lacZ expression in a time course study to monitor viral pathogenesis. Resistant-aged larvae displayed evidence of immune responses to foci of infection, including encapsulation and melanization of infected tissues and clearing of infected tracheolar cells, suggesting that the immune system plays a significant role in developmental resistance to baculovirus.

12:24 Development and transmission of microbial fauna through the life history of the Asian longhorned beetle, (*Anoplophora glabripennis*)

Scott M. Geib and Kelli Hoover, Department of Entomology, Pennsylvania State University, University Park, PA.

The Asian longhorned beetle (ALB; *Anoplophora glabripennis*, Family Cerambycidae) thrives in an inhospitable environment on an intractable energy source, the inner-wood of a wide variety of hardwood trees. Hardwoods are high in lignin and contain anti-microbial secondary metabolites. How this beetle is able to degrade wood is largely unknown. We hypothesize that gut community structure can change as the beetle goes through its lifecycle, allowing this insect to exploit multiple regions of the tree and a broad range of host tree species, contributing to its invasive behavior. In this study we characterized the ALB gut community as a function of life stage, and determined the source of gut microbes as maternally derived or acquired through feeding on the host tree. To compare gut microbial communities among different developmental stages, we used B-ARISA (Bacterial- Automated Ribosomal Intergenic Spacer Analysis) combined with cloning and sequencing. This method allows rapid comparison of microbial diversity in many samples at one time. We found unique bacterial species in the woody tissue chewed by the female within the egg site and in eggs collected from host trees. The presence of microbes from these locations suggests bacterial species were transmitted by the mother to the egg. Other species of bacteria appear to be acquired from the host tree. Understanding how this insect is able to acquire and change its gut community will allow for better understanding of how it is able to exploit a broad range of host trees.

12:36 More than muck munchers: Detritivores mediate predator herbivore interactions

Jessica E. Hines and Robert F. Denno, Department of Entomology, University of Maryland, College Park, MD.

Although it is widely recognized that primary production and decomposition are necessarily linked, there has been little investigation into the nature of interactions between primary producer and decomposer-based food webs. In the salt marsh system, predatory spiders such as *Pardosa littoralis* aggregate in areas rich in leaf litter-detritus where they feed on both herbivores and detritivores. In order to examine the relative influence of species interactions on primary production as opposed to decomposition we conducted a mesocosm experiment. In a factorial combination of mesocosms containing the salt marsh cord grass *Spartina alterniflora*, we manipulated the presence and absence of leaf litter, herbivores, detritivores, and predators. We measured how changes in interactions between these factors altered the ability of spiders to exert top-down control on detritivores and herbivores and examined cascading effects on decomposition and primary production. Detritivores were consumed by *Pardosa* spiders even in the presence of herbivore prey. Decomposition rates were enhanced by the presence of detritivores and reduced in the presence of spiders, an effect that was dampened in the presence of herbivores. Notably, the presence of leaf litter and isopods enhanced primary production when herbivores and predators were excluded. These results emphasize that the strength of predator-detritivore interactions can mediate both ecosystem processes (decomposition and primary production) and food web interactions among predators and herbivores.

12:48 **Success after a bottleneck: Persistence of an introduced insect with low levels of genetic and phenotypic variation**

Robert G. Ahern, Micheal J. Raupp and David J. Hawthorne, Department of Entomology, University of Maryland, College Park, MD.

Cooley spruce gall adelgid (CSGA), *Adelges cooleyi*, is an important insect pest native to the Rocky Mountains and west coast. CSGA was introduced into the eastern United States by movement of infested plant material during the mid-nineteenth century. We performed molecular genetic analyses using both mitochondrial (mtDNA) and nuclear markers (amplified fragment length polymorphisms [AFLPs]) in an attempt to locate the source of introduced populations. The Colorado Rockies was identified as the likely source of introductions and two distinct genetic lineages were identified in the native range, indicating significant divergence and suggesting that CSGA represents a cryptic species assemblage. Importantly, our data show that only one of these lineages has been introduced into the eastern US. Both mtDNA and AFLP data confirm that insects from introduced populations have decreased genetic variation relative to insects from populations within the native range. A choice-test assay was conducted to measure host preference, an important herbivore trait associated with local adaptation. Insects from introduced populations have decreased phenotypic variation relative to insects from populations within the native range. In addition, insects with similar genotypes have significantly similar host preference, indicating the possible utility of genetic-based tools for predicting the likelihood of successful establishment and range expansion of introduced species. This work represents one of the first empirical studies to document the genetic consequences of an insect introduction and correlate genetic variation with degree of adaptation to host plants.

1:00 **Ecological traits correlate with abundance in a riparian forest macrolepidopteran larval assemblage**

Eric M. Lind and Pedro Barbosa, Department of Entomology, University of Maryland, College Park, MD.

Surveys of local abundance of many taxa, including herbivorous insects, exhibit predictable species abundance distributions characterized by numerical dominance of a few species and a long tail of many scarce species. An intensive five-year survey of macrolepidopteran larvae feeding on the riparian tree ash-leaf maple (*Acer negundo* L.) also reveals such a pattern. While various macroecological explanations for these patterns exist, few studies of animal communities have attempted to relate mechanistic, ecological hypotheses of population dynamics to observed abundance levels for many species simultaneously. Using the survey dataset to characterize abundance, we examined the correlative relationships between ecological traits such as fecundity, relative larval growth rate on the shared host plant, and parasitism rates on the shared host plant, with observed abundance. Phylogenetically informed analysis of data from 24 species spanning the full abundance distribution shows a strong positive relationship of relative growth rate (mass added/day corrected for final pupal mass) with long-term abundance; and a positive relationship of parasitism rate with long-term abundance. Fecundity data was equivocal with respect to abundance and highly variable by species. These results suggest mechanistic population-level hypotheses for predictable abundance levels in this system, with implications for theoretical understanding of abundance distributions in general.

1:12 Genotypic divergences and constraints in host plant use by polyphagous macrolepidoptera

J. Gwen Shlichta and Pedro Barbosa, Department of Entomology, University of Maryland, College Park, MD.

The diversity of plant-animal interactions provides evidence demonstrating the iterative adaptive changes in interacting species attempting to enhanced fitness and survival. A central theme in ecology is understanding the factors that influence interacting animal and plant species. This study focuses on the role of a plant host as a driving force for genetic changes in herbivores. In this study, I have examined a suite of lepidopteran larvae on several different tree species in forests of eastern Maryland for phenotypic and genetic host-associated differentiation. Larvae were collected from at least three different tree species at three different sites in eastern Maryland. DNA was extracted from the adult moth for analysis of genetic differentiation. Using Amplified Fragment Length Polymorphism (AFLPs), each species was examined for host-associated genetic differentiation. As in other ecological studies of assemblages or guilds, changes in some species are distinct from those of other species in the assemblage on each tree host species. In addition, changes in clusters of species, of those that comprise the assemblages on trees, parallel each other but are distinct from other clusters in regard to genotypic changes.

1:24 The influence of native plants on arthropod diversity

Ellery A. Vodraska¹, Douglas Tallamy², Paula M. Shrewsbury¹ and Michael J. Raupp¹. (1) Department of Entomology, University of Maryland, College Park, MD; (2) Department of Entomology and Wildlife Ecology, University of Delaware, Newark, DE.

Maintaining a diverse population of prey in an urban landscape is necessary to attract and support sustainable populations of predators and parasitoids. This relationship is fundamental to the implementation of conservation biological control. The modern urban landscape is dominated by alien ornamentals; these plants are unacceptable hosts for many of the specialist herbivores that evolved to be dependent on native plants. Alien dominated landscapes may therefore host a less diverse prey population for natural enemies. We predict that landscapes that are dominated by native plants host a diverse herbivore population that will attract and sustain a diverse population of predators and parasitoids relative to landscapes dominated by alien plants. Two types of ‘urban’ landscapes were planted to test this prediction; one dominated by native ornamentals and another dominated by alien ornamentals. The plants within the native and alien landscapes were sampled twice during the growing season to quantify the density and diversity of their herbivore and natural enemy populations. The results revealed that the native plants were associated with a greater density and diversity of herbivores than the alien plants. The herbivore populations in the native landscapes translated to an increased predator and parasitoid density and diversity. These results demonstrate the potential for native plants to enhance conservation biological control efforts and provide a new tool for pest management in the expanding urban environment.

1:48 Alternative food type mediates predator community structure and herbivore survival in a corn agroecosystem

Steven D. Frank, Paula M. Shrewsbury and Robert F. Denno, Department of Entomology, University of Maryland, College Park, MD.

It is increasingly recognized that omnivores, organisms that consume food resources from more than one trophic level, are widespread in both agricultural and natural ecosystems. Omnivorous predators include plant and prey alternative food in their diet, which has spurred debate over their value in biological control. Alternative foods may attract and sustain predator populations in times of low herbivore abundance and thus enhance the biological control of pests. However, alternative food may also interfere with biological control by reducing per-capita consumption of pests and by altering the composition of predator communities. We investigated how different alternative food sources (seeds or fly pupae) affect the abundance of omnivorous and carnivorous predators in a corn agroecosystem. Ultimately we examine how changes in the predator community cascade down to affect herbivore and plant survival. In a factorial field experiment we subsidized plots with seeds, fly pupae, both or neither while monitoring predator populations, black cutworm (pest) survival, and damage to corn seedlings. Results of the field experiment demonstrate that seeds and pupae have variable effects on predator community composition. In general, strict carnivores such as centipedes and spiders were more abundant in plots where pupae were added while omnivores such as carabid beetles responded to seed and pupae additions. However, the presence of pupae significantly reduced predation on black cutworms. These results emphasize how alternative food resources can interact with the composition of higher trophic levels (omnivorous versus carnivorous predators) to alter the strength of trophic cascades.

2:00 Floral-supplemented buffer strips as refuges for natural enemies: source or sink?

Laura C. Moore, Terry Patton, Amy Miller, Galen P. Dively and Robert F. Denno, Department of Entomology, University of Maryland, College Park, MD.

Grass buffer strips along crop fields are commonly deployed in Mid-Atlantic agricultural landscapes to filter nutrients, reduce surface erosion, and increase biodiversity. Additional nectar and pollen resources provided by wildflower plantings in buffers are thought to positively impact natural enemies of crop pests in adjacent crop systems. However, the spatial consequences of such natural-enemy refuges for pest suppression in neighboring crops remain largely unexplored. We investigated the presence/absence of wildflower supplements on natural enemy abundance in buffer strips and in neighboring agricultural fields. Furthermore, we assessed pest density in crops at different distances from buffer habitats. Results indicated that floral buffers had higher densities of parasitoids than did non-floral structural control buffers. However, adjacent agricultural fields exhibited the opposite effect, suggesting that floral buffers may act as a sink for natural enemies. Key words: agriculture, natural enemies, predator subsidies.

2:12 Spatial and temporal dynamics of endemic entomopathogenic nematodes in annual bluegrass weevil (Coleoptera:Curculionidae) infested golf course turfgrass

Benjamin A. McGraw and Albrecht M Koppenhofer, Department of Entomology, Rutgers University, New Brunswick, NJ.

The annual bluegrass weevil (*Listronotus maculicollis* Dietz) (ABW) is a highly destructive pest of short mowed golf course turfgrass in the Northeastern United States. Golf course superintendents rely heavily on the use of preventive chemical pesticides to suppress egg laying adults since early instar ABW are stem borers and largely protected from most chemical treatments. In an effort to develop less toxic management options for ABW, we are investigating the role of natural enemies, namely entomopathogenic nematodes (EPNs), in the population dynamics of ABW. Between 2005 and 2006 we monitored the effect of endemic EPNs on ABW populations at three golf courses in New Jersey. Populations of the EPNs *Heterorhabditis bacteriophora* and *Steinernema carpocapsae* in the soil varied greatly among sites yet showed a similar seasonality to their abundance on the golf course fairways. EPN densities were highest in June when ABW soil stages were densest, followed by a dramatic decline as temperatures increased and soil moistures and hosts encounter rates decreased. Vertical soil sampling revealed that neither species were found in the uppermost soil profile (0-5 cm) during the hottest parts of the summer when 2nd generation ABW larvae were likely to be present in the soil. *H. bacteriophora* was found as low as 15 cm during this period, returning to the surface in the end of August when conditions improved. *S. carpocapsae* went undetected between the middle of July and early August, suggesting that this species recolonizes golf course fairways from surrounding areas.

2:24 Factors associated with local scale spread of pink hibiscus mealybug, (Hemiptera: Pseudococcidae)

Justin Vitullo¹, Christopher Bergh², Aijun Zhang³ and Catharine Mannion⁴. (1) Department of Entomology, Virginia Polytechnic Institute and State University, Blacksburg, VA; (2) Virginia Polytechnic Institute and State University, Alson H. Smith, Jr. Agricultural Research and Extension Center, Winchester, VA; (3) Chemicals Affecting Insect Behavior Laboratory, USDA, Agriculture Research Service, Beltsville, MD; (4) Department of Entomology, University of Florida, Tropical Research and Education Center, Homestead, FL.

The pink hibiscus mealybug (PHM), *Maconellicoccus hirsutus* Green, is a highly polyphagous pest that invaded Florida in 2002. Despite the implementation of biological control efforts in Florida, the number of counties infested by PHM has rapidly increased from 9 in 2004 to 36 in 2006. Although information on its dispersal capabilities is critical toward assisting with predicting, modeling, and managing its spread in the southern US, very little is known about its natural modes of dispersal on a local scale. Our initial studies in 2006 investigated aerial dispersal in relation to abiotic factors, as well as the relationship between the number of male PHM captured in sex pheromone traps and the latency to infestation of sentinel hibiscus plants. To measure aerial dispersal, potted hibiscus plants heavily infested with PHM were surrounded by sticky traps and monitored at 4-h intervals for seven consecutive days. The aerial dispersal of PHM crawlers occurred with a circadian rhythmicity that peaked between 2 and 6pm. Crawlers demonstrated directionality in accordance with prevailing wind direction. Initial examination of the relationship between male PHM captured in sex pheromone traps and latency to infestation was conducted by placing plants in residential locations rated as having low, medium and high PHM infestations. Plants at 13 of 20 locations became infested during the 60 day trial. Information regarding local dispersal will help optimize biocontrol and monitoring programs improving our ability to manage the risk associated with this important, invasive pest of production agriculture and managed landscapes.

2:36 Spatial factors associated with the initiation and spread of dogwood borer infestation in newly planted apple orchards

Daniel L. Frank¹, Tracy C Leskey² and Chris Bergh³. (1) Department of Entomology, Virginia Polytechnic Institute and State University, Blacksburg, VA; (2) USDA, Appalachian Fruit Research Station, Kearneysville, WV; (3) Virginia Polytechnic Institute and State University, Alson H. Smith Jr. Agricultural Research and Extension Center, Winchester, VA.

The dogwood borer, *Synanthedon scitula* (Harris) (Lepidoptera: Sesiidae), is a pest of a wide range of agricultural, ornamental, and landscape trees. In apple trees on size-controlling rootstocks, burr knots that are often formed below the graft union appear to be attractive oviposition sites for mated female dogwood borer and are typically where infestations originate. In addition, certain cultural practices can have an impact on dogwood borer infestations by promoting burr knot formation. Currently, very little data has been gathered on the spatial factors involved with initiation and spread of dogwood borer in newly established orchards. To develop baseline information on these activities, we incorporated previous data from two newly planted research apple orchards located in Jefferson County, WV and Frederick County, VA into a geospatial model to analyze infestation trends over a three-year period. Results showed that the total number of infested trees increased dramatically towards the end of the second growing season and continued rising until the end of the third season. In addition, infestations in trees appeared to spread more often up and down rows rather than across rows. Cultural management practices were also shown to affect the spread of infestation. These results provide the basis for development of further studies that can lead to more efficient methods for control of dogwood borer in apple orchards.

2:48 Dispersal behavior of neonate European corn borer, *Ostrinia nubilalis* Lepidoptera: Crambidae, on transgenic Bt corn

Jessica A Goldstein¹, Charles Mason¹ and John Pesek². (1) Entomology and Wildlife Ecology, University of Delaware, Newark, DE; (2) Food and Resource Economics, University of Delaware, Newark, DE.

Most Lepidoptera disperse as adults where they are able to fly long distances, but in some groups the larvae disperse as well. Larval dispersal takes the form of ballooning where the larvae use their silk to hang off of plant surfaces and some get picked up by the wind. The longer the silk length, the greater the drag and the more likely the larva is to get picked up by the wind and the farther the larva will travel. The European corn borer (ECB), *Ostrinia nubilalis*, has been observed ballooning and is currently the target of a large control effort using transgenic Bt corn. We examined the differences between ECB larval dispersal on Pioneer 34K78 Mon 810 event Bt corn and Pioneer 34K77 non-Bt isoline corn. We allowed an ECB egg mass to hatch on either a Bt or non-Bt plant and recovered the larvae 24 hours later to see if they had left the plant. We then used a logistic regression mixed model to test the significance of the data. Our results suggest that ECB larvae that hatch out on a Bt corn plant abandon that plant with a much higher frequency than ECB larvae that hatch out on a non Bt corn plant. This behavior could help behavioral resistance to Bt corn to evolve in ECB.

3:00 Potential of a pheromone based attract-and-kill strategy to improve management of strawberry sap beetle (Coleoptera: Nitidulidae)

Rebecca L. Loughner and Gregory M. Loeb, Department of Entomology, Cornell University, New York State Agricultural Experiment Station, Geneva, NY.

The strawberry sap beetle (SSB) has become a pest of increasing concern to strawberry growers in the Northeastern United States in recent years. Attract-and-kill strategies have been effectively used in tree fruit to control other species of Nitidulids. SSB have shown behavioral evidence that a male-produced aggregation pheromone is used for communication. Effective deployment of attract-and-kill traps in strawberry is dependent on understanding 1) the distribution of SSB throughout strawberry farms on a regional scale, 2) the mobility of SSB within an area, and 3) the influence of the landscape surrounding strawberry fields on the population dynamics of SSB. Research to date shows that the beetles are more widely present than previously thought, are capable of flight, and use habitat surrounding strawberry fields as food and overwintering resources. Based on this research and the attraction of both males and females to traps containing male-produced volatiles and a food odor, strawberry is an ideal system to implement an attract-and-kill strategy for SSB management.

3:24 Diversity of rhizobial plant symbionts influences soybean aphid populations

Jennifer M. Dean and Consuelo M. De Moraes, Department of Entomology, Pennsylvania State University, University Park, PA.

Legumes are highly valued, both agriculturally and ecologically, for their ability to enhance soil nitrogen through symbiotic interactions with nitrogen-fixing bacteria (rhizobia). Although the mutualism between legumes and rhizobia is well-studied, especially in important crop systems such as soybeans, the implications of these interactions on herbivores are not well understood. Association with rhizobia may cause changes to the host plant in terms of defense pathway induction or translocation of bacterial compounds throughout the plant. Additionally, the large genetic diversity of rhizobia could result in a variety of host plant responses when inoculated with different strains of bacteria. Our results suggest that the genetic diversity of rhizobia in the soil may be influencing soybean herbivores. Populations of the soybean aphid were monitored on plants receiving nitrogen from one of three sources: 1) a commercially prepared rhizobial inoculant, 2) rhizobia naturally present in the soil, or 3) an artificial fertilizer. One week before aphid populations peaked, plants inoculated with rhizobia, whether from the commercial inoculant or from natural populations, were similar in terms of leaf nitrogen content, plant dry weight, and nodule dry weight. However, the aphid populations throughout the season were significantly lower on naturally inoculated plants, while the higher number of aphids on commercially inoculated plants more closely matched numbers on fertilized plants, which had higher leaf nitrogen levels. These results could lead to the development of better rhizobial inoculants for agricultural purposes that enhance the resistance of host plants against herbivores.

3:36 Evaluating the impact of plant-growth-promoting-rhizobacteria and natural enemies on *Myzus persicae* infestations in pepper

Caroline Boutard and Brian A. Nault, Department of Entomology, Cornell University, New York State Agricultural Experiment Station, Geneva, NY.

Management of green peach aphid, *Myzus persicae*, in pepper, utilizing a combination of plant-growth-promoting-rhizobacteria (PGPR) and endemic biological control was explored in New York. PGPRs are non-pathogenic bacteria that induce plant defensive responses. Our hypothesis was that densities of *M. persicae* would be lower in PGPR treated pepper plots compared with untreated plots. Moreover we hypothesized that densities of natural enemies in PGPR treated plots would be higher than in untreated plots, because of increased volatile synomones released from PGPR-treated plants. Peppers were seeded in soil containing the PGPR formulation, BioYield™, or untreated soil. Plants were later transplanted into field plots and treated with one of three insecticide treatments (Fulfill - aphicide, Asana XL – pyrethroid, untreated control) when a 1 aphid/leaf threshold was reached. The experimental design was considered a split-plot with BioYield™ as the main plot factor and insecticide as the sub-plot factor. Apterous *M. persicae* and natural enemies were counted weekly. Peppers were harvested 3 times. BioYield™ did not affect aphid densities; however, insecticide increased numbers in the Asana treatment because it flared the population. No interaction was observed. In contrast, season total number of natural enemies was affected by an interaction between BioYield™ and insecticide. More natural enemies were observed in BioYield™ plots treated with Asana than in non-BioYield™ plots treated with Asana, whereas natural enemy densities were equivalent among the other treatments. Yield in BioYield™ plots was approximately twice that of non- BioYield™ plots in the first harvest, suggesting that BioYield™ enhances early season yield.

3:48 Evidence of an aggregative oviposition behavior for viburnum leaf beetle, *Pyrrhalta viburni* (Paykull), and potential benefits and costs associated

Gaylord A Desurmont and Paul A. Weston, Department of Entomology, Cornell University, Ithaca, NY.

Pyrrhalta viburni, an invasive chrysomelid native to Europe and first detected in the USA in 1994, is becoming a major landscape pest in the Northeast and poses a serious threat to a large portion of the U.S. Larvae and adults feed on shrubs in the genus *Viburnum*, and plants in both managed landscapes and natural areas are at risk. Plants belonging to susceptible species are often killed within a few years, but plants belonging to resistant species are rarely heavily defoliated. *P. viburni* adult females lay eggs in groups in small cavities they excavate in the twigs. Such egg masses are often found in clusters on infested twigs, which were believed to be the work of single females. However, laboratory trials showed that *P. viburni* adult females exhibit an aggregative oviposition behavior: in choice-tests, females preferred to lay eggs in twigs containing egg masses rather than intact twigs, and laid their eggs in close proximity to existing egg masses. Analysis of egg mass densities on field-collected *Viburnum dentatum* twigs revealed that twig mortality and defense rate were highly correlated with magnitude of infestation, suggesting apparent benefits and downsides to this behavior. Results of this research shed light a new aspect of viburnum leaf beetle biology, and add to our understanding of the ecology of this invasive pest.

4:00 Effect of bean leaf beetle feeding injury on early-growth stage snap beans

Meredith E. Cassell¹ and Thomas P. Kuhar². (1) Department of Entomology, Virginia Polytechnic Institute and State University, Blacksburg, VA. (2) Virginia Polytechnic Institute and State University, Eastern Shore Agricultural Research and Extension Center, Painter, VA.

The bean leaf beetle (BLB), *Cerotoma trifurcata* (Forster), is a major pest of snap beans in the eastern and central U.S. Adults feed on leaves and pods of soy beans, snap beans and other legumes. Research on economic injury levels for this pest has focused primarily on soybeans. In order to gain more insight into the impact of early-season BLB defoliation on snap beans we conducted field-cage and manual leaf-hole punch studies. Walk-in exclusion cages were used to house snap bean plants in the field containing 0, 1, 2, 3, 4 and 5 bean leaf beetles per plant in each of six cages. Foliar damage was assessed using a leaf area meter at 30 and 40 days post planting while whole-plant and pod yields were assessed at harvest. BLB density had a significant effect on defoliation and leaf area at 30 days after planting. However, leaf area data collected 40 days post planting showed no significant difference between cages. There was also no significant difference between whole-plant and pod weight. Manual leaf hole punch studies, which simulated BLB feeding also revealed no significant effect of defoliation on snap bean yield. Based on these data, it appears that snap bean plants can overcome early-growth stage defoliation from BLB without significant loss in pod yield. This resilience to foliar injury in snap beans appears to be similar to that exhibited by soybeans, and thus BLB can probably be managed in both crops under comparable IPM guidelines.

4:12 Evaluation of fall soil sampling for predicting spring infestation of secondary soil pests in corn

Timothy A. Jordan¹, Roger R. Youngman¹, Curt A. Laub¹, Thomas P. Kuhar² and Siddharth Tiwari¹. (1) Department of Entomology, Virginia Polytechnic Institute and State University, Blacksburg, VA; (2) Virginia Polytechnic Institute and State University, Eastern Shore Agricultural Research and Extension Center, Painter, VA.

A field study was started in fall 2005, and continued in spring 2006, to predict spring infestation levels of secondary soil pests, specifically white grubs (Coleoptera: Scarabaeidae) and wireworms (Coleoptera: Elateridae) in cornfields. Fifteen post-harvest soybean fields were sampled in late October, early November, and late March, in several eastern Virginia counties using a randomized complete block design with 15 replicates. Current sampling procedures for secondary soil pests are done in the spring prior to planting by visually inspecting a 30-cm² by 15-cm deep (standard method) volume of soil for annual white grubs or by using some form of baiting method for wireworms and annual white grubs. A 20.3-cm² by 15-cm deep sample method was evaluated for its potential to correlate to the standard method after a 2.25 weighting factor (the standard method samples 2.25 x more volume of soil than the 20.3-cm² by 15-cm deep method). No significant differences were detected in both fall and spring between the two methods after correcting for differences in sampling volume. Fall 2005 and spring 2006 sampling, respectively, indicates abundant white grub densities ranging from 0.9-10.1 and 0.4-6.8 grubs per standard method. In fall, 12 samples exceeded the economic threshold of 2 grubs per standard method, and in spring, 8 samples. In all fields, the fall and spring pest densities will be evaluated against corn grain yield loss in a control and two insecticide seed treatment rates, low and high. Wireworms averaged less than 1 wireworm per standard method in each sampling period.

4:24 Survey of European natural enemies of swallow-worts (*Vincetoxicum* spp.)

Aaron S. Weed¹, Richard A. Casagrande¹ and André Gassmann². (1) Department of Plant Sciences, Biological Control Laboratory, University of Rhode Island, Kingston, RI; (2) CABI Switzerland Centre, Delémont, Switzerland.

Two swallow-worts (*Vincetoxicum nigrum* and *V. rossicum*), originating from Europe, have become established in the eastern United States and Canada. Their population expansion and aggressive growth threaten native plant species, alter ecological processes, and cause problems in agricultural settings. The lack of herbivory on these plants by native insects in North America and the difficulty in controlling these weeds has spawned interest in a biological control program. During 2006, surveys for potential biocontrol agents in Central and Eastern Europe revealed the herbivores: *Eumolpus asclepiadeus* and *Chrysolina aurichalcea* (Chrysomelidae); *Euphranta connexa* (Tephritidae); and *Abrostola asclepiadis* and *Hypena opulenta* (Noctuidae). Caterpillars of *Hypena opulenta* are leaf-feeders and this multivoltine species successfully develops on both target weeds. This species was not previously reported developing on *Vincetoxicum*. Host range testing has shown that both chrysomelids feed on the leaves of the target weeds as adults and the root-feeding larvae of *E. asclepiadeus* feed and develop on both target weeds. Future research will continue with host range and specificity testing of each species to evaluate their potential as biological control agents of *Vincetoxicum*.

4:36 Residual toxicity of imidacloprid treated cotoneasters to hawthorn lace bugs: a field and greenhouse study

Adrianna Szczepaniec and Michael J. Raupp, Department of Entomology, University of Maryland, College Park, MD.

Hawthorn lace bug (*Corythucha cydoniae*) is a key pest of cotoneaster, a shrub commonly planted in landscapes. Imidacloprid is a systemic neonicotinoid insecticide known to control lace bugs. The objective of this study was to determine how long the insecticide protects plants from the herbivore. The experiment included cotoneasters planted in landscape beds and containerized shrubs maintained in a greenhouse. Presence of the lace bugs on landscape cotoneasters was surveyed, and direct toxicity of imidacloprid treated shrubs was evaluated in the laboratory. Laboratory bioassays of landscape plants and containerized cotoneasters were performed in petri plates using plant clippings and third instar lace bugs obtained from naturally infested cotoneasters at the University of Maryland, College Park campus. We found that cotoneaster grown in the landscape and containers had a long-lasting protection from the lace bug. Landscape grown plants treated with imidacloprid remained lace bug free and toxic to the pest for 19 months. Containerized cotoneasters exhibited toxicity for 26 months after treatment with the insecticide.

4:48 Efficacy of microwave irradiation for the eradication of pine engraver beetles in red pine logs

Maya E. Nehme¹, Kelli Hoover¹, John Janowiak² and Jeffrey Kimmel². (1) Department of Entomology, Pennsylvania State University, University Park, PA; (2) School of Forest Resources, Pennsylvania State University, University Park, PA.

Previous studies have demonstrated the efficacy of microwave treatment for eradicating insects infesting wooden packing materials used in international shipping. In this study, we investigated the ability of microwave energy to destroy larvae, pupae and adults of the pine engraver, *Ips pini*, in naturally infested red pine logs. For this purpose, 18 x 8 inch red pine logs were infested with an average of 24 pairs of adults (one male and one female). Each pair was introduced log by enclosing them in a plastic capsule with the open end stuck into the bark of the log. Beetles were given 10 days to bore in the bark, mate and lay eggs followed by 5 additional days for egg hatch and early larval establishment. At the end of this 15 day period, each log was divided longitudinally into 4 quarters, one of which was used as a control (infested but not microwaved). Each section was microwaved till the core reached a target temperature of 50, 55 or 60°C. After treatment, the bark was peeled to assess insect status. Mortality ranged from 96-100% at all 3 temperatures, and was significantly highest at 60°C for adults. 100% of pupae died at all 3 temperatures. Results indicate that microwaves may be an effective alternative for eradication of bark beetles in wood.

APPENDIX D

Monday Afternoon

Fruit Symposium Abstracts

1:26 Semiochemical-based management of blueberry pests

Cesar Rodriguez-Saona

Rutgers University, P.E. Marucci Blueberry/Cranberry Research and Extension Center.
Chatsworth, N.E.

Plant volatiles play a critical role in an insect's life. These volatiles are used by foraging herbivorous insects for long-distance food and mate finding. Natural enemies (predators and parasitoids) are also known to use plant volatile cues during host- and prey- finding. The emission of volatiles from plants often increases following herbivore damage. Recent studies have shown that application of jasmonic acid, and its volatile derivative methyl jasmonate, can mimic the volatile response to herbivore feeding in several species of plants. The use of plant volatile cues to manipulate insect behavior in the field has so far been limited. Their lack of species-specific properties, compared to sex pheromones, might be limiting a wider use of plant volatiles in pest management. For instance, the same volatile stimuli used by insect pests to find host plants may be used by beneficial insects. Compared to sex pheromones, however, plant volatiles have the advantage of attracting both sexes, and thus serve as better cues for monitoring female populations. Plant volatiles can be employed for the development of traps for insect monitoring as well as in mass-trapping, attract-and-annihilate, trap-crops, and push-pull strategies for insect control. Plant volatiles have also been used to attract natural enemies in the field. I will summarize previous work I conducted for the development of plant-based attractants for the Western tarnished plant bug, *Lygus hesperus*, in cotton and alfalfa and for the emerald ash borer, *Agrilus planipennis*. I will discuss how plant responses to herbivore feeding may affect the abundance of herbivores and natural enemies on plants in complex environments (i.e., heterogeneous habitats and multiple herbivory). Finally, I will present the work I am currently conducting to study the volatile response of blueberries to herbivore damage and methyl jasmonate, and the potential use of blueberry volatiles for management of insect pests. This is an exciting time for the study of behaviorally-based alternatives to chemical control in blueberries. Loss of insecticides due to health and public concerns and an increasing interest in organically-grown blueberries may promote the use of new alternative controls such as plant-based attractants. However, widespread adoption of plant-based attractants for monitoring and management of blueberry pests will ultimately be dependent on their efficacy and economics.

2:08 Evaluation of Potential Products for Organic Control of Apple Maggot, *Rhagoletis pomonella* (Walsh)

W. Harvey Reissig, D. Combs, and C. Smith

Entomology Department, NYSAES, Geneva, NY 14456

Three treatments were compared in this study: (1) Curveball™ spheres. (2) Entrust and (3) Gf-120 Naturalyte Fruit Fly bait. The Entrust and GF120 Naturalyte sprays were applied on a

weekly basis while flies were active in July and August. The Curveball™ spheres are not approved for use in organic orchards, primarily because they are used with an attractant, but the other two treatments are organically certified. Trials were conducted in an orchard in Western NY that had been treated only with organically approved insecticides and fungicides during the last 3 seasons. No insecticides were applied in the research plot area during July, August, or September when apple maggots were active. During the early part of the season in July, significantly more flies were captured on sticky red monitoring spheres in the Curveball™ treatments than in any of the other plots. In general, catches were very similar in the check plots and the GF-120 and Entrust treatments. Although catches in all plots were higher during August, the same pattern continued, and catches were significantly higher on all dates in the Curveball™ plots than in the rest of the treatments except for the last two weeks of the season. Also, catches were generally significantly lower and relatively similar in the Entrust, GF-120 and check plots during August. Apple maggot pressure was high in the research orchard during the growing season as indicated by an average fruit infestation level of 23% in the untreated check plots. Entrust (11.3% damage) was the only treatment that significantly reduced apple maggot injury at harvest below that in the check treatments. Even though the overall apple maggot damage in the Curveball plots was not significantly lower than that in the check plots, twice as many flies were captured (505) during the season in these treatments compared to the checks (242). Consequently the average damage inflicted/fly in the Curveball plots was considerably lower (0.05) than that observed in the check plots (0.1). Therefore it appears that the Curveballs were capable of killing large numbers of flies attracted to the plots, but their effectiveness could not compensate for the higher populations of flies that were attracted into their localized area throughout the season by the network of volatile lures. In the future, to enhance the effectiveness of this Curveball™ system for controlling a localized, indigenous population of flies, it would be desirable to utilize a system that would not attract flies from long distances throughout the orchard, but would only attract flies within a single tree canopy to encounter the toxicant on the traps.

3:05 Apples even a bug couldn't love: the search for host-plant resistance in *Malus*.

Clayton T. Myers¹, W. H. Reissig², and P. L. Forsline³

¹USDA-ARS, Appalachian Fruit Research Station, Kearneysville, WV

²Cornell University, New York State Agricultural Experiment Station, Geneva, NY,

³USDA-ARS, Plant Genetic Resources Unit, Geneva, NY.

Research is ongoing to evaluate apple germplasm (both domestic releases and exotic apple and crabapple species from around the world) for potential natural resistance to attack from insect pests. There is significant variation in pest susceptibility among exotic *Malus* species housed at the USDA germplasm repository in Geneva, NY. Studies from 2006 indicate that *Malus tschonoskii* is very resistant to larval feeding by both oriental fruit moth (OFM) and codling moth (CM) in the laboratory. Larval survival on fruit of *M. tschonoskii* was zero or near zero. While *M. tschonoskii* has some negative horticultural traits that would be obstacles to breeding efforts, there is reason to believe it may possibly be a potential source for genetic resistance to internal feeders. Other *Malus* accessions, while previously appearing promising in the field, had varying susceptibility to internal feeders in the laboratory, and thus, are probably not good sources of genetic resistance. Several cultivars from the Purdue-Rutgers-Illinois (PRI) apple breeding program released with claims of insect pest resistance are actually not resistant to attack

from CM or OFM. However there may be potential with one of these releases for partial resistance to apple maggot.

3:26 The Integration of a Baculovirus and Pheromone Mating Disruption to Manage Codling Moth and Oriental Fruit Moth in Pennsylvania Apple Orchards

Larry A. Hull

Penn State University, Fruit Research and Extension Center, Biglerville, PA 17307

A series of studies were conducted over three years to use a baculovirus – Cyd-X® and pheromone mating disruption to control populations of the codling moth, *Cydia pomonella* (L.), and the oriental fruit moth, *Grapholita molesta* (Busck) on apple. Various pheromone technologies were utilized in large blocks of apple trees at the beginning of moth flight and virus applications were made using the alternate row middle system of spraying at phenological timings and rates. Fruit injury from these two pests was substantially reduced at harvest for all years of study.

3:47 Conservation Biological Control of Aphids in Apple Orchards

Mark W. Brown¹ and Clarissa R. Mathews²

¹USDA, ARS, Appalachian Fruit Res. Sta., Kearneysville WV

²Institute for Environmental Studies, Shepherd Univ., Shepherdstown, WV

Conservation biological control is a key element in developing a sustainable pest management strategy. We are investigating the potential for increasing levels of biological control of arthropod pests in apple by providing additional food sources in the form of extrafloral nectar from peach trees interplanted in the apple orchard. The amount of biological control of spirea aphid, *Aphid spiraecola*, and rosy apple aphid, *Dysaphis plantaginea*, was compared in apple orchards with 0%, 9%, and 50% peach trees from 2003 to 2005. Biological control, predominantly by adult *Harmonia axyridis* (Coccinellidae), was significantly greater in orchards with 9% peach trees than apple monocultures or in orchards interplanted with 50% peach trees. It is suggested that optimal levels of biological control of aphids by *H. axyridis* is in orchards with about 9% peach trees producing extrafloral nectar. A higher proportion of alternate food sources will result in interference with biological control in this aphid/coccinellid system.

APPENDIX E

Monday Afternoon

Biological Control Symposium Abstracts

8:05 Dispersal and Impact of the Mile-a-Minute Weevil.

Ellen Lake and Judy Hough-Goldstein, University of Delaware, Newark, DE

Mile-a-minute weed, *Polygonum perfoliatum*, was introduced to the United States in the late 1930s, and has spread to eleven states ranging from Massachusetts to West Virginia. The USDA approved the release of the curculionid weevil *Rhinoncomimus latipes* Korotyaev for biological control of this annual invasive weed in 2004. Weevil adults feed on mile-a-minute foliage; the larvae feed within nodes and may cause sufficient damage to reduce seed production. The weevils are active from early spring through multiple hard frosts in the fall and complete at least 4 generations. Weevils have been released in Delaware, Maryland, New Jersey, Pennsylvania and West Virginia and have established at every release site. Three 50-meter diameter release arrays in southeastern Pennsylvania were monitored to track weevil dispersal and impact on mile-a-minute. Within fourteen months, weevils had dispersed to mile-a-minute patches up to 800 meters from the release. Seed cluster production was lower in 2006 than in 2005 at all three Pennsylvania sites and at several New Jersey release sites. The ability to establish populations, coupled with a high reproductive rate and dispersal capacity bode well for the potential of the weevil to be an effective biological control agent for mile-a-minute.

8:45 Update on Biological Control of Kudzu.

Matthew J. Frye and Judy Hough-Goldstein, University of Delaware, Newark, DE

In 1999 the US Forest Service targeted kudzu (*Pueraria montana* var. *lobata* (Willd.) Maesen & S. Almeida) for biological control, and initiated a 3-year survey of its natural enemies in China. To date, more than 100 phytophagous insects have been associated with the plant. Two of these insects were recently evaluated in the US to determine their host range, and both caused substantial damage to soybean (*Glycine max* (L.) Merr.) and the North American native plant, hog-peanut (*Amphicarpaea bracteata* (L.) Fernald), during quarantine studies. The phylogenetic relationship of kudzu to soybean and hog-peanut therefore presents a challenge for kudzu biological control. However, many insects remain to be tested. To aid in the identification of potentially effective agents, a field study in the US will test the timing and type of damage with the greatest negative impact on kudzu growth and dispersal using simulated herbivory.

8:55 Biological Control of *Phragmites*.

Richard Casagrande, University of Rhode Island, Kingston, RI

Over the past several decades, *Phragmites australis* populations in North America have dramatically increased in both freshwater and brackish wetlands, particularly along the Atlantic Coast. This has caused declines in wetland wildlife, decreases in plant diversity and alterations

in nutrient cycling and hydrologic regimes. Although there are some remaining populations of native *P. australis*, most stands on the East Coast are now known to be of exotic origin. A collaborative biological control program with Bernd Blossey of Cornell and CABI Europe Switzerland has identified several potential biological control agents which are now undergoing host range testing. Recent results suggest it may be possible to develop a biotype-specific biological control program for exotic *P. australis*.

9:20 Biological Control of Swallow-Worts.

Weed, A.S., Casagrande, R.A., Department of Plant Sciences, University of Rhode Island, Kingston, RI, and Gassmann, A., CABI Switzerland Centre, Delémont, Switzerland

Two swallow-worts (*Vincetoxicum nigrum* and *V. rossicum*), originating from Europe, have become established in the eastern United States and Canada. Their population expansion and aggressive growth threaten native plant species, alter ecological processes, and cause problems in agricultural settings. The lack of herbivory on these plants by native insects in North America and the difficulty in controlling these weeds has spawned interest in a biological control program. During 2006, surveys for potential biocontrol agents in Central and Eastern Europe revealed the herbivores: *Eumolpus asclepiadeus* and *Chrysolina aurichalcea* (Chrysomelidae); *Euphranta connexa* (Tephritidae); and *Abrostola asclepiadis* and *Hypena trigonalis* (Noctuidae). Caterpillars of *Hypena trigonalis* are leaf-feeders and this multivoltine species successfully develops on both target weeds. This species was not previously reported developing on *Vincetoxicum* and this is the first collection of *H. trigonalis* in Europe. Host range testing has shown that both chrysomelids feed on the leaves of the target weeds as adults and the root-feeding larvae of *E. asclepiadeus* feed and develop on both target weeds. Future research will continue with host range and specificity testing of each species to evaluate their potential as biological control agents of *Vincetoxicum*.

9:45 Initiating a Biological Control Program for *Ailanthus altissima* (tree-of-heaven) in Virginia.

Kok, L. T., Salom, S. M., Yan, S., McAvoy, T. J., and Herrick, N.J., Department of Entomology, Virginia Polytechnic Institute and State University, Blacksburg, VA

Ailanthus altissima (Mill.) Swingle (tree-of-heaven) is an invasive tree from China that is established throughout much of continental USA. It colonizes disturbed sites, often outcompetes native vegetation, and is very difficult to remove. It infests several hundred acres in the Shenandoah National Park in Virginia. Many miles of highway rights of way are heavily infested with it and control is costly. We initiated a biological control program for this weed in Virginia, sponsored by the USDA Forest Service, Forest Health Technology Enterprise Team. Research conducted and steps taken to date include the following: (1) Assess the economic significance of tree of heaven. (2) Field survey the prevalence of the weed and its associated native herbivores in Virginia. (3) Import into our quarantine laboratory a potential biological control agent, *Eucryptorrhynchus brandti* (Harold), from China. (4) Develop rearing procedures for *E. brandti*. (5) Compile list of host plants for quarantine testing for submission to TAG. (6) Conduct preliminary host specificity tests of *E. brandti*. Results indicate that tree-of-heaven is common in Virginia but there are few native herbivores feeding on it. Some success has been achieved in lab rearing *E. brandti* and preliminary feeding tests indicate that it is quite host specific.

10:25 Genetics of Herbivore Host Specificity: Implications for Biological Control of Weeds.

Keith Hopper, USDA-ARS, Newark, DE

Several reviews and workshops on non-target impacts of biological control introductions suggested that retrospective analyses should be used to test predictions about non-target impacts, host range, and host range evolution. Although the evidence from biological control introductions indicates that host ranges have not evolved after introduction, the broader literature provides examples of genetic variation and rapid evolution in host range. The likelihood of host range evolution could be predicted from knowledge of the DNA sequences of genes that determine host range, current genetic variation in host range among the population being introduced, or the phylogeny of host range in the clade of the candidate being introduced. Examples of using each approach are discussed.

10:50 “Intelligent Design”: on a new approach to weed biocontrol.

Richard Casagrande, University of Rhode Island, Kingston, RI

In some cases exotic plants can act as a population sink – stimulating oviposition on plants unsuitable for larval development. For example, the native American butterfly *Pieris napi oleracea* oviposits on exotic garlic mustard *Alliaria petiolata* and the native monarch butterfly *Danusa plexippus* oviposits on both black swallow-wort *Vincetoxicum nigrum* and pale swallow-wort *Vincetoxicum rossicum*, but their larvae cannot survive on these plants. It is possible that through time, these native insects will successfully adapt to these exotic plants. Is it possible through laboratory selection to accelerate this process and develop strains of these insects which can successfully develop on these plants? Could they be released and serve as native biological control agents for these exotic plants? We'll discuss the concept.

APPENDIX F

Tuesday Morning

Submitted Paper Abstracts

9:36 QRD 400, A Novel Plant Extract for Plant Insect and Mite Pest Management.

H. Brett Highland, AgraQuest, Inc., Nokomis, FL., Paul Walgenbach and Helene Chiasson, AgraQuest, Inc., Davis, CA.

Advances in isolation and identification techniques in recent years has led to the increased discovery of novel plant compounds. The area of biopesticides has benefited from this, leading to the discovery of QRD 400, a plant extract derived from *Chenopodium ambrosioides* var. *ambrosioides*, a plant closely related to common lambsquarter. The extracts, made up of mono-terpenes and sesquiterpenes, work in concert, via several modes of action, to control a broad range of soft bodied insects. Extensive testing at from 0.25% to 2% v/v in field and greenhouse environments have shown QRD 400 to provide good control of a broad array of soft bodied insect and mite pests. In the greenhouse QRD 400 has provided control of thrips, mites, whiteflies, mealybugs and fungus gnats. No known problems with any mix partners have been noted (to date). QRD 400 has been shown in trials to be safe for beneficials, and its different mode of action makes it an excellent rotation partner for resistance management. This product shows immediate and residual control of pests through dual modes of action. It is less persistent in the environment than many synthetic chemistries, and controls immature and adult stages. QRD 400 has been shown to be effective for use against pests prone to resistance. Plant testing at labeled rates across an array of common greenhouse plants has indicated little potential for it to cause any adverse plant effects or phytotoxicity. Field testing indicates that QRD 400 has particularly good activity on thrips and mites. Other insects controlled in field trials include whiteflies, aphids, leaf miners, mealybugs, and sod webworms. In the field QRD 400 will have a fit on fruits, vegetables and tree and vine crops. QRD 400 has multiple modes of action, is safe to many beneficial insects, is short lived in the environment, and is safe to mammals. It is pending US EPA approval, with potential for OMRI/IMO/NOP certification.

10:48 Comparison of aquatic insect communities between adjacent headwater and main-stem streams in urban and rural watersheds.

Robert F. Smith and William O. Lamp, University of Maryland, Dept. of Entomology, College Park, MD

Watershed urbanization causes decreased diversity and taxa richness in aquatic insect communities. The current paradigm suggests that degraded local habitat quality is the primary cause. Recent research examining patterns of community composition suggest that regional processes, while secondary, may also influence the response of aquatic insect communities to watershed urbanization. I compared headwater communities in urban and rural watersheds, and investigated if community similarity in adjacent stream reaches were greater in urban watersheds. I sampled insect communities in paired headwater and main-stem streams belonging to three urban and three rural watersheds during three seasons. Taxa richness and the Shannon

diversity index were lower in urban than rural headwater streams. The Jaccard similarity index calculated between headwater and main-stem communities was greater for urban streams during one season, and the proportion of headwater taxa shared with the main-stem community was greater for urban than rural stream pairs. These results suggested that urbanization expectedly decreased diversity, but the increased similarity suggested that a regional process partly controlled taxa loss. A significant interaction between watershed type and the riffle location longitudinally along the headwater for the Jaccard index further suggests that this process had a component dependent on the proximity to the main-stem. The regional process that effected stream insect communities may be adult dispersal constraints. I present preliminary data collected a year later that showed lower adult activity in urban than rural watersheds. This knowledge is important for developing successful conservation and restoration plans for urban headwater streams.

11:12 Liquid detection and consumption in the caterpillar *Manduca sexta*.

Da Shi, Baltimore, MD, Marc Rowley, Berea, KY, and Frank Hanson, Department of Biological Sciences, University of Maryland Baltimore County, MD

Our lab recently discovered that the antennae of the tobacco hornworm, *Manduca sexta*, act as humidity detectors and we hypothesized that the antennae can also detect liquid water. Two assays were used, one measured the time it took for the larvae to find liquid (presumably by measuring olfaction) and the other measured how much liquid was consumed (presumably by measuring taste). Two groups of larvae were tested: normal and those without functional antennae. The normal group, after a moderate amount of time (10 minutes), oriented to and drank the water droplet when encountered. Those without their antennae, however, took longer to encounter (15 minutes) and had a low probability of drinking. Since the larvae's natural diet consists solely of leaves, we used the same assays to test how the larvae will behave in the presence of sap from leaves instead of water. Leaves of tobacco and potato (two of the larvae's host plants) were crushed and their sap collected. The larvae encountered the sap sooner (5 minutes) but consumed less of it compared to the water. Thus, we conclude the antennae are critical for finding and consuming water and that chemicals in leaf saps can change the attractiveness of the liquid but the mechanisms responsible for these behaviors are still unknown. Future experiments will determine the role of the antennae in nutrient detection and will also involve chemical fractions of plant extracts to narrow down specific stimulants and deterrents.

11:24 Crowding in early life causes deformities in insects.

Christopher Wells, Alex Bohorquez, and Frank Hanson, Department of Biological Sciences, University of Maryland Baltimore County, MD

We have observed that some caterpillars of *Manduca sexta* in our laboratory culture have developmental abnormalities. These include the loss of parts or all of various external organs and appendages, including eyespots, antenna, epipharynx, maxillae and its component structures, the maxillary palpus and styloconicum. Our concern was that loss of some these organs may impact our research on feeding behavior. In nature, insects like these are typically found one animal per plant; however in the research laboratory, animals are often reared in higher densities. We have found that rearing animals in increasingly larger population densities proportionally increases the percentage of deformities. Caterpillars grown in populations of 1, 10, 40, 60, and

100 per container (plastic shoe box) show deformity rates of 0, 12, 24, 28, and 41 percent respectively. We are currently testing the hypothesis that the abnormalities are caused by exposure to volatile chemicals released by the caterpillars at increasingly dense populations. Preliminary results are positive, and further experiments testing this hypothesis will be presented.

11:36 **Using the 50% Formic Acid Fumigator to control Varroa mites in Florida, 2006.**

Jim Armine, Division of Plant / Soil Sciences, West Virginia University, Morgantown, WV, Bob Noel, Beekeeper, Cumberland, MD, and David Webb, Florida State Beekeepers Association, Cocoa, FL

In 2006, 31 colonies were treated with 50% formic acid fumigation, < 24 hrs, in Florida. Mite mortality in capped drone cells was 1) 99.2% on 3 April; T 84° F, ~50% RH, 9:15am; 85ml 50% FA + 15 ml Honey-B-Healthy (to prevent queen loss); 2-deep, single hive demonstration; DPI “Church bee Yard”, Alachua Co., FL. 2) 92.6% on 15 August; T 94° F, 58,7% RH; 1:30pm; 90ml 50% FA +15 ml HBH; 10, 2-deep colonies (Hope Ranch, Cocoa, FL). 3) 93.7% on 23 October (T 81.8° F, RH 41.2%; 5pm; with 110 ml 50% FA + 15 ml HBH, 5PM; 20, 2-deep colonies (Duda Ranch, Melbourne, FL). Overall average varroa mortality was 93.5% in capped drone cells; varroa mortality in capped worker cells and on adult bees was > 94%; mortality in 10 control colonies per treatment in Aug and Oct was less than 1.5%. Old, thicker brood combs were more impervious to vapors of 50% formic acid.

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