FLORIDA ENTOMOLOGICAL SOCIETY

95TH ANNUAL MEETING PRESENTATION ABSTRACTS

Jupiter, Florida July 22-25, 2012

8:00 AM - Sailfish

General Session

8:00 AM-8:10 AM - Sailfish

Introduction: Gary Leibee, President, Florida Entomological Society

8:10 AM-8:20 AM

President's Address: **Doctor of Plant Medicine/Health - A professional degree for IPM - Entomological aspects.** Gary Leibee. Institute of Food and Agricultural Sciences, Mid-Florida Research and Education Center, 2725 Binion Road, Apopka, FL 32703-8504

The Doctor of Plant Medicine Program (University of Florida) and Doctor of Plant Health Program (University of Nebraska–Lincoln) train plant practitioners through intensive coursework and experiential learning across the various disciplines that impact plant health and plant management, conferring the Degrees of Doctor of Plant Medicine (DPM) and Doctor of Plant Health (DPH). These plant doctors diagnose and solve plant health problems, and utilize the principles of IPM to develop integrated crop and pest management systems that maximize economic, environmental, and social sustainability. The entomological aspects of the training involved and the expectations of the DPM/DPH are reviewed.

8:30 - 9:20 AM

FES Pioneer Lecture Honoring Dr. Howard Vincent Weems, Jr.: Dr. Howard Vincent Weems, Jr.: A dynamic pioneer in Florida Entomology. Norman. C. Leppla and Harold. A. Denmark. PO Box 110620 Bldg. 970 Natural Area Drive Gainesville, FL 32611. ncleppla@ufl.edu

Dr. Howard V. Weems, Jr. was unique among pioneering Florida entomologists in his personality, conduct and many valuable contributions to insect taxonomy. He was recognized most for his determination to build the Florida State Collection of Arthropods into one of the premier reference and research collections in the world. He accomplished this feat having grown up in Sebring, Florida and been educated at Emory University, the University of Florida and Ohio State University. His Ph.D. dissertation was entitled “The Syrphid Flies of Southeastern United States (Diptera: Syrphidae).” He was a tough-minded product of his Southern youth, intensely competitive and zealous in his work. As a consequence, he became an avid and accomplished arthropod collector, exacting curator, and expert journal editor. Dr. Weems insisted on excellence in his professional activities, as well as in his favorite football team, the Florida Gators. He considered life, and entomology in particular, a great adventure.

Monday, 9:00 AM- 6:00 PM - Marlin room

Posters Session 1

[DSP 1] **New simple methods for studying hemipteran stylets, bacteriomes and salivary sheaths in host plants.** El-Desouky Ammar and David G. Hall. USDA-ARS, Subtropical Insects Research Unit, USHRL, Fort Pierce, FL. 45945. eldammar@hotmail.com

Microscopic and behavioral studies on five hemipteran species from four families (Psyllidae, Aphididae, Cicadellidae, and Aleyrodidae) showed that their exuviae normally had either fully or partially extended stylets in a feeding-like position. In most cases these stylets were still partially embedded in their host plants after ecdysis, which indicated that plant-feeding hemipteran nymphs use their stylets to anchor themselves to host plants during molting. This phenomenon was used to study the stylet length and ultrastructure in various nymphal instars. Additionally, autofluorescence was used for studying the hemipteran salivary sheaths in host plants. This method is based on fixation of hand sections of the plant parts on which the insects have been feeding, then mounting and examination of these sections with epifluorescence or confocal microscopy. No embedding, microtomy or staining is necessary for this method which makes it much faster and simpler than other methods. Autofluorescence was also used to study the location and size of bacteriomes/mycetomes (organs containing symbionts) in intact hemipteran eggs and nymphs. The above methods were applied successfully with the Asian citrus psyllid (*Diaphorina citri*), melaleuca psyllid (*Boreioglycaspis melaleucae*), oleander aphid (*Aphis nerii*), the whitefly *Bemisia tabaci*, and/or the glassy-winged sharpshooter leafhopper (*Homalodisca vitripennis*).

[DSP 2] **Life history of pink hibiscus Mealybug on *hibiscus rosa–sinensis* cultivars.** Luis F. Aristizábal, Catharine Mannion, Christopher Bergh and Steven Arthurs. University of Florida, Mid-Florida Research and Education Center, Apopka, FL 32703. larist@ufl.edu.

The pink hibiscus mealybug, *Maconellicoccus hirsutus* Green, is an invasive pest in Florida and elsewhere. We evaluated three cultivars of *Hibiscus rosa-sinensis* expected to have high ('President'), low ('Double Red'), and intermediate ('Joanne') levels of susceptibility to this pest. We found little evidence that *M. hirsutus* responded differently among the 3 cultivars in terms of survival, development rate, size, or oviposition period in laboratory tests. In greenhouse tests over 9 weeks, feeding symptoms of stunted and deformed plant terminals "bunchy top" were observed in all cultivars but increased more rapidly in "President", especially after the 4^{th} week post infestation. Higher mealybug populations also developed on this cultivar. reaching ≈ 50 and 1,400 insect per terminal after the first and second generations.

[DSP 3] **Distribution of *Bemisia tabaci* (Hemiptera: Aleyrodidae) biotypes in North America following the Q invasion.** Cindy L McKenzie, James A. Bethke, Frank J. Byrne, Joseph R. Chamberlin, Timothy J. Dennehy, Aaron Dickey, Dan Gilrein, Paula M. Hall, Scott Ludwig, Ronald D. Oetting, Lance S. Osborne, Lin Schmale, Robert G. Shatters, Jr. USDA/ARS, 2001 South Rock Road, Fort Pierce, FL 34945. cindy.mckenzie@ars.usda.gov

As part of an APHIS coordinated multi-state/agency/institutional Q biotype task force initiative, a coordinated whole country survey was conducted across North America from Jan 2005 to Dec 2010 including Bermuda, Hawaii, Canada and Mexico with the primary objective to monitor the introduction of Q biotype and distribution of all *Bemisia* biotypes (B, Q, New World). New World biotype was detected in Texas multiple times representing the first reports of this biotype in the U.S. since its rapid displacement in the late 1980s by biotype B. Biotype Q was detected in 23 U.S. states, Mexico plus first reports of biotype Q in Canada and Bermuda. Biotype Q was found in protected commercial horticultural greenhouses of 45% of all ornamentals and herbs and one tomato transplant collection, but never in open field agriculture. Genetic markers identified three populations of biotype Q whiteflies supporting the inference of independent invasions from at least three different sources. Although detected as very rare occurrences, B-Q hybrids did occur but showed no evidence of persistence. Our results suggest that, unlike other countries where the Q biotype has invaded field crops, in the U.S. rapid detection/implementation of improved control strategies targeting the Q biotype has prevented the establishment of this pest beyond greenhouse production.

[DSP 4] **Common Florida weeds as hosts of the silverleaf whitefly, *Bemisia tabaci*.** Hugh A. Smith, Yankai Li and Steve Kalb. Mailing address: University of Florida IFAS/GC REC, 14625 CR 672, Wimauma, FL 33598. hughasmith@ufl.edu.

Weeds common in Florida agricultural production were evaluated in the field and under greenhouse conditions as hosts of the silverleaf whitefly, *Bemisia tabaci*. Oviposition and nymphal development were quantified in relation to total plant leaf area at sequential stages of weed development. Weeds evaluated included *Abutilon theophrasti* (velvetleaf), *Bidens pilosa* (hairy beggarticks), *Ipomeae* spp. (morning-glory), *Indigofera hirsuta* (hairy indigo), *Rumex crispus* (curly dock), *Senna obtusifolia* (sicklepod), *Sesbania exaltata* (coffee weed), and *Solanum americanum* (nightshade).

[DSP 5] **Ants associated with *Diaphorina citri* and their role in its biological control in South Florida.** Bernardo Navarrete and Jorge Peña. University of Florida, Department of Entomology and Nematology, TREC, 18905 S.W. 280 Street, Homestead, FL 33031

As a vector of citrus greening, *Diaphorina citri* is considered the major insect problem for the citrus industry in Florida. Two specific parasitoids of this pest has been introduced, but the parasitism rates are beyond satisfactory. One of the reasons of this lack of control could be the interaction of the parasitoids with other arthropods present in the system. Ants (Hymenoptera: Formicidae) have been found already interfering with parasitoids with other Hemipteran pests. In this research we identified and observed the behavior of ants present in *Murraya paniculata*

infested flushes with *D. citri* during a 24 h period in and we conducted two experiments of ant exclusion using Tanglefoot as a physical ant barrier in both orange jasmine and in Persian lime. The results show at least four species of ants are tending *D. citri* in South Florida. These species are: *Brachymirmex patagonicus, B. obscurior. Pheidole megachepala* and *Solenopsis invicta.* These ants are active day and night and were seen feeding on the sugar excretions of *D. citri* nymphs. The results of the ant exclusion experiment show that the percentage of parasitism by *Tamarixia radiata* was significantly higher in the flushes where ants were excluded. We discuss if ant exclusion would be a technique that citrus growers can use as a tactic to increase parasitism of *D. citri*.

[DSP 6] **UV-reflective technologies for managing thrips and Tospoviruses in fruiting vegetables**Kara Tyler-Julian, Charles Funderburk, Joe Funderburk, Steve Olson, and Pete C. Anderson. NFREC, IFAS, University of Florida, Quincy, FL. Galen Frantz and Charles Mellinger (Glades Crop Care, Jupiter, FL).

We have conducted over a decade of research on ultraviolet-reflective technologies as tactics for managing *Frankliniella occidentalis* in fruiting vegetables. Ultraviolet-reflective mulches provide excellent control of thrips and thrips-vectored tomato spotted wilt virus and kaolin provides suppression. Management recommendations for thrips and tospoviruses in fruiting vegetables are described.

[DSP 7] **Conservation biological control in pepper and eggplant.** Stuart Reitz, Mrittunjai Srivastava, and Joe Funderburk. USDA-ARS-CMAVE Tallahassee, FL.

Several important factors contribute to low productivity in pepper and eggplant due to western flower thrips. Research has been conducted to develop an understanding of flower thrips population dynamics and insecticide efficacy studies have allowed us to direct recommendations for biological control of western flower thrips. Present studies provide guidelines for growers in making management decisions.

[DSP 8**] Feeding and reproduction of the brown lacewing, *Sympherobius barberi* (Neuroptera: Hemerobiidae) on diets of Asian citrus psyllid *Diaphorina citri* (Hemiptera: Psyllidae) and flour moth *Ephestia kuehniella* (Lepidotera: Pyralidae)** Azhar A. Khan, Jawwad A. Qureshi, Muhammad Afzal and Philip A. Stansly. University of Florida IFAS/SWFREC, Immokalee, FL 34142. azharkhan@ufl.edu.

Sympherobius barberi a brown lacewing is reported as an important predator of several insect pests from Asia, Europe and America but never tested against the Asian citrus psyllid (ACP), *Diaphorina citri*, vector of huanglongbing or citrus greening disease. Adults of *S. barberi* were equally effective in consuming ACP eggs and nymphs under both light and dark conditions. Females laid more eggs when fed with ACP eggs compared diets of nymphs or eggs of flour moth *Ephestia kuehniella*. Adult longevity was similar on psyllid and *Ephestia* diets. More eggs were deposited on twisted and wrinkled white paper compared to similar black paper or leaves of citrus, orange jasmine, eggplant or cantaloupe.

Monday, 9:45 - 11:45 AM - Sailfish room

Symposium: *Tamarixia radiata* for Managing Asian Citrus Psyllid in Florida

Organizers: Jawwad A. Qureshi and Norman C. Leppla. University of Florida, Institute of Food and Agricultural Sciences Entomology and Nematology Department. SWFREC, Immokalee, FL and Gainesville, FL.

9:45 - Introduction - Jawwad A. Qureshi and Norman C. Leppla

9:50

[1] **History of *Tamarixia radiata* in Florida citrus** Phil Stansly, Jawwad Qureshi, Ru Nguyen and Eric Rohrig. University of Florida IFAS/SWFREC, 2685 SR 29 N, Immokalee, FL 34142. pstansly@ufl.edu.

Tamarixia radiata is one of two primary parasitoids of the Asian citrus psyllid *Diaphorina citri* and the most likely candidate for inoculative and augmentative biological control of this pest due to its host finding and completive abilities. Colonies brought in by Ru Nguyen and Marjorie Hoy from Taiwan and Vietnam, the former tracing back to northwestern India, were mixed and released in 1999-200. This "Florida strain" quickly established throughout the state as verified in a cooperative survey in 2006 that also demonstrated the need for augmentation of the parasitoid. This and subsequent work funded by the Florida citrus box tax first through the Florida Citrus Production Research Advisory committee (FCPRAC) and then the Citrus Research and Development Foundation (CRDF) has supported research and development of methods for mass rearing and field evaluation in commercial citrus that continue to this day. Production in 2011 included approximately 304,000, 301,000, 347,000 *T. radiata* originally from south China, Pakistan, and North Vietnam respectively as well as 510,000 of the "Florida" strain, a total of 1.46 million wasps, from colonies maintained at DPI, Gainesville and UF-IFAS Immokalee. Wasps are released in the field, used for colony maintenance and research with the ultimate goal of developing a biologically based management system for this pest.

10:10

[2] **Incidence of parasitism following augmentative releases of *Tamarixia radiata* (Hymenoptera: Eulophidae) for control of *Diaphorina citri* (Hemiptera: Psyllidae) in Florida citrus.** Jawwad A. Qureshi and Philip A. Stansly. University of Florida IFAS/SWFREC, 2685 SR 29 N, Immokalee, FL 34142. jawwadq@ufl.edu.

Tamarixia radiata, a species specific ectoparasitoid of the Asian citrus psyllid (ACP), *Diaphorina citri* was imported from Taiwan and South Vietnam and released in Florida 1999 - 2001. In 2006-2007 we observed that the parasitoid was established throughout the citrus growing region of the state, although parasitism rates were variable, averaging <20% particularly during spring when citrus trees flush hardest and ACP numbers are mounting suggesting a need for augmentation. We initiated a mass rearing and release program using the already established

strain and brought in new colonies from Pakistan, South China and North Vietnam. During the last 3 years, approximately 1.5 million adult *T. radiata* have been released in Florida citrus from all four colonies. We have observed two to three times more parasitism at release sites during spring and summer compared to sites without releases, showing that augmentative release can potentially increase incidence of parasitism by *T. radiata* in the field. Cooperative efforts with citrus producer OrangeCo, the Division of Plant Industry (DPI), and USDA-ARS are aimed at establishing large scale mass rearing facilities for *T. radiata*, with the ultimate aim of increased ACP mortality and reducing the incidence and severity of huanglongbing or citrus greening disease.

10:30

[3] **Mass production and evaluation of *Tamarixia radiata* for biological control in a commercial citrus operation.** Lynn Steward, Jerry Newlin, Shawron Weingarten (A Duda and Sons, Labelle, FL), Jawwad A. Qureshi (UF IFAS/SWFREC) and Philip A. Stansly (UF IFAS/SWFREC). Orange Co. Lp, 12010 N.E. Hwy 70, Arcadia,Fl.,34266. LSteward@orangecofla.com

A mass production facility for *Tamarixia radiata* was established at Orange Co, Arcadia, in April 2009 using the "Florida strain' originally from Taiwan and South Vietnam. Initially, 10 Bug Dorm cages each with four orange jasmine plants infested with Asian citrus psyllid (ACP) were established inside a 12' x 12' air conditioned room into which *T. radiata* adults were introduced 8 days later to start the colony. Soon we scaled up with 3,000 plants and a 35' X 100' ACP house s, 4 containers with grow lights, air-conditioning, humidifiers, irrigation and timers for rearing the wasps and another container for harvesting. Flushing orange jasmine are moved to the ACP house for 8 to 10 days for infestation, then exposed to *T. radiata* in the containers. Eight days later, infested shoots are trimmed and placed in harvesting boxes for emergence and collection of parasitoids for field release. Trimmed plants are sprayed to kill remaining psyllids and recycled. To date, we have released 132,000 *T. radiata* adults and used 150,000 for colony. We are also working with UF-SWFREC researchers to determine effectiveness of *T. radiata* on large trees enclosed in cages and blocks of citrus treated with soft and hard chemistries to control psyllid.

10:50

[4] **Bionomics of Asian citrus psyllid associated with orange jasmine hedges in Florida, with special reference to biological control by *Tamarixia radiata*.** David G Hall and Evan Braswell. USDA-ARS**,** 2001 South Rock Road**,** Fort Pierce, FL 34945. David.Hall@ars.usda.gov.

The Asian citrus psyllid (ACP) is an important invasive citrus pest because it vectors a bacterium responsible for a devastating disease of citrus known as huanglongbing. Orange jasmine (*Murraya paniculata*) is a favored alternate ACP host plant and is widely grown as an ornamental plant in urban areas in Florida. ACP management in urban areas could be an important component of area-wide psyllid suppression. A project is therefore being conducted to assess the bionomics of ACP in urban plantings of jasmine and includes assessments of biocontrol of ACP by the eulophid parasitoid *Tamarixia radiata*. In addition to assessing control by an established population of *T. radiata*, assessments are being made of control by parasitoid populations from south China, North Vietnam and Pakistan that are being released at some urban

locations. Finally, estimates are being made of invasibility by newly released parasitoid populations on established parasitoid populations.

11:10

[5] **Mass rearing and evaluation of *Tamarixia radiata* (Hymenoptera: Eulophidae) a biological control agent of *Diaphorina citri* (Hemiptera: Psyllidae).** Trevor Smith, Abbie Fox, Eric Rohrig, and Robin Stuart. FDACS, Division of Plant Industry, Methods Development and Biological Control, 1911 SW 34th Street, Gainesville, FL 32608. Eric.Rohrig@freshfromflorida.com.

In addition to using chemical and mechanical methods to combat both the Asian citrus psyllid, *Diaphorina citri* (Hemiptera: Psyllidae), and citrus greening disease, the utilization of biological control agents is a vital component of a long term management plan. Two imported species specific parasitoids of the Asian citrus psyllid are currently being reared, released and evaluated by FDACS-DPI. Four strains of the ectoparasitoid *Tamarixia radiata* (Hymenoptera: Eulophidae) and two strains of the endoparasitoid *Diaphorencyrtus aligarhensis* (Hymenoptera: Encyrtidae) are maintained at a Division of Plant Industry laboratory in Gainesville, Florida. Efforts to develop the technology to effectively rear these parasitoids have culminated into the construction of a FDACS-DPI mass rearing facility in Dundee, Florida. This facility will supply large quantities of parasitic wasps to citrus growers and researchers around the State. The effect of mass releases of parasitoids on psyllid populations will be monitored and evaluated through the cooperative efforts of FDACS-DPI, UF and USDA personnel.

11:30 - 11:45 AM **Discussion**

End of Symposium

1:00 - 3:17 PM - Pompano room

Master's Student Competition

Dr. Dan Hahn, Student Activities Committee Chair,

1:00 - Introduction

1:05

[6] **Comparison of different diets for development of *Olla v-nigrum* (Coleoptera: Coccinellidae) and *Ceraeochrysa cubana* (Neuroptera: Chrysopidae) in the laboratory.** Joel Mendez, Jawwad Qureshi, and Phillip Stansly. UF/IFAS Southwest Florida Research and Education Center, 2685 SR 29 N, Immokalee, Fl. 34142. mendez.1@ufl.edu

The ladybeetle *Olla v-nigrum* and the green lacewing *Ceraeochrysa cubana* are considered to be important generalist predators of a wide range of pests in Florida citrus groves. The objective of this study was to compare larval development of *O. v-nigrum* and *C. cubana* on different diets

that might be conveniently used to rear these beneficial insects under laboratory conditions. Larvae of both predators were reared individually in petri dishes where one of three types of food were offered to *O. v-nigrum* and one of two food types were offered to C. *cubana ad libitum* every two days. A significantly greater number of *O. v-nigrum* larvae reached the adult stage and a lower percentage of larval mortality occurred on a diet of *Ephestia kuehniella* Zeller (Lepidoptera: pyralidae), eggs and *Rhopalosiphum maidis* (Homoptera: Aphidae) nymphs compared with frozen beef liver. Surprisingly, eggs of *E. kuehniella*, an unnatural food, provided a better diet than *R. maidis* nymphs for the development of *C. cubana* although *R. maidis* nymphs were also satisfactory.

1:17

[7] **Efficacy of *Isaria fumosorosea* (= *Paecilomyces fumosorosea*) and horticultural oil on cuttings infested with the Madeira mealybug, *Phenacoccus madeirensis* Green.** **Sarahlynne Guerrero, A. Hodges, L. Osborne, and P. Avery.** Department of Entomology, University of Florida, Natural Area Drive PO Box 110620, Gainesville, FL 32611-0620**. slynne89@ufl.edu**

Phenacoccus madeirensis Green, also known as the Madeira mealybug, has been an invasive cosmopolitan ornamental pest by causing extensive feeding damage and facilitating sooty mold growth through honeydew excretion on host plants. To prevent further dissemination via propagation transportation, ornamental cuttings infested with the Madeira mealybug were dipped into various concentrations of *Isaria fumosorosea* (PFR) and horticultural oils in a 6 X 6 Latin square experimental design. Collected data were used to determine synergistic combinations. Phytotoxicity tests for each ornamental cutting and pathogenicity tests for all Madeira mealybug life stages were conducted under greenhouse and laboratory conditions, respectively. This research may lead to further studies in utilizing PFR, horticultural oil, or synergistic combinations for establishing a treatment model for transporting preclearance ornamental cuttings.

1:29

[8] **Anesthetization with CO2 of *Tamarixia radiata* (Waterston) (Hymenoptera:Eulophidae), parasitoid of *Diaphorina citri* (Hemiptera: Psyllidae).** Xulin Chen and Philip A. Stansly. UF/IFAS Southwest Florida Research and Education Center, 2685 SR 29 N, Immokalee, Fl. 34142. xulin527@ufl.edu.

Tamarixia radiata is the principal parasitoid of *Diaphorina citri*, vector of huanglongbing, a disease now affecting all of Florida citrus. A rapid method of separating adult parasitoids and hosts would be useful to facilitate counting and collecting from colonies used for research or augmentative biological control of the psyllid. Most wasps recovered about 2.5 minutes after exposure to 100% CO_2 for 5 minutes, with no significant difference between males and females. Fecundity declined significantly compared with unexposed wasps but no significant differences were observed in longevity up to 20 days. These results indicate that *T. radiata* is quite resistant to CO_2, possibly more so than *D. citri* which will be evaluated next.

1:41

[9] ***Cricotopus lebetis* (Diptera: Chironomidae), a fortuitous biological control agent of Hydrilla verticillata.** Karen Stratman, William Overholt, James Cuda, Mike Netherland, and P. Chris Wilson,. Indian River Research and Education Center, University of Florida, 2199 South Rock Road, Fort Pierce, FL 34945. kstratman@ufl.edu

A chironomid midge, *Cricotopus lebetis* Sublette (Diptera: Chironomidae), was discovered attacking hydrilla in Crystal River, Citrus Co., Florida in the 1990s, and may be a recent introduction into Florida. Larvae of the midge mine in the apical meristems of hydrilla, causing basal branching and stunting of the plant. We investigated the distribution, biology and host range of the midge. The midge was found in a few Florida water bodies, but it was not often abundant. Survey and water quality data were collected from several different water bodies in Florida, and data was correlated to the abundance of the midge. The relationship of temperature to developmental biology of the midge revealed that development was highest at temperatures between 20 and 30°C, and increased with increasing temperature. Host range studies showed that *C. lebetis* completed development on hydrilla and several other aquatic plants. Additional host range tests were conducted to see if *C. lebetis* showed preference to certain host plants. Adult oviposition tests were conducted to determine if females prefer to lay eggs in water containing host plants. Host finding behavioral tests were also conducted to determine the searching behavior of *C. lebetis* when locating a host. The results of these studies will be used to access the potential of *C. lebetis* as a biological control agent of hydrilla.

1:53

[10] **RNAi-Based strategy for Asian citrus Psyllid (*Diaphorina citri*) control: A method to reduce the spread of citrus greening disease.** Chloe Hawkings, Kent Morgan, Linsday Shaffer, Charles Powell, Dov Borovsky, Ron Cave, William O. Dawson, Siddarame Gowda and Robert G. Shatters Jr., University of Florida REC, 2199 South Rock road, Fort Pierce, Florida, 34945. c.hawkings@ufl.edu

Citrus greening disease is a serious bacterial disease of citrus worldwide and is vectored by the Asian citrus psyllid (*Diaphorina citri*). The only effective control strategy includes vigorous control of the psyllid, primarily through heavy reliance on pesticides. As a more sustainable and environmentally friendly method of psyllid control, we evaluated a RNA interference (RNAi) approach based on psyllid oral uptake of dsRNA molecules that target specific psyllid genes. This approach is based on the finding that cellular uptake of dsRNAs, that match the sequence of essential genes, results in down regulation of those genes and can lead to cell/organism death. These dsRNA molecules were introduced into the psyllids through feeding on citrus engineered to express the dsRNA using a Citrus tristeza virus as a paratransgenesis vector. Increased toxicity was observed when adult psyllids were fed on citrus producing dsRNA targeting either psyllid cathepsin or vacuolar ATPase genes. No increased psyllid toxicity was observed in psyllids fed on citrus producing green fluorescent protein (GFP) dsRNA. Toxicity related to specific psyllid gene knockout will be discussed. These results suggest that RNAi-based control may be a viable alternative to current pesticide use for control of psyllids and all phloem feeding pests.

2:05

[11] **Life history and taxonomy of *E. quadrator* immature stages.** Sara A. Brennan, Joe. E. Eger and Oscar E. Liburd. University of Florida, 970 Natural Area Drive, Gainesville FL 32611. sbrennan@ufl.edu.

Euschistus quadrator is a relatively new pest to the southeastern United States. It was first found in Florida in 1992, and has since spread throughout the state. It is a key pest in cotton, soybean and corn, which suggests that *E. quadrator* may be increasing its southern range and host status. The adults and eggs of *E. quadrator* have been described, but the nymphal stages have not. Since *E. quadrator* is often found in same habitats as *E. servus*, there is potential for confusion when trying to identify stink bug species present. For this reason, the immature stages of *E. quadrator* would be of significant help to growers who are identifying the stink bug species present in their crops. A laboratory colony of *E. quadrator* was established from wild caught adults and nymphs. Eggs were collected from the colony for one week. Eggs were reared to adult, and life history information was calculated for all instars. Taxonomic descriptions of the immature stages of *E. quadrator* were also completed.

2:17

[12] **Host preference of the brown marmorated stink bug, *Halyomorpha halys* (Stål) (Hemiptera: Pentatomidae), using economically important crops of Florida** Ashley Poplin and Amanda Hodges. University of Florida, Entomology and Nematology Department, 970 Natural Area Drive, PO Box 110620, Gainesville, FL 32611. apoplin0524@ufl.edu

Halyomorpha halys (Stål), also known as the brown marmorated stink bug, has become an economically important pest in the United States. This invasive pest is highly polyphagous and has reportedly caused economic damage of fruit trees and soybean in the Mid-Atlantic States. Although the brown marmorated stink bug has not yet been detected, the distribution of this stink bug is expected to include northern and central parts of Florida. The purpose of this research was to determine the potential economic impact of the brown marmorated stink bug by exploring its host range and host preference. No-choice and choice tests were conducted in a quarantine laboratory using six test plant species. The results of this research will be provided to extension agents and farmers for their potential use, and may give insight on the movement of the brown maramoted stink bug if it became established in Florida.

2:29

[13] ***Drosophila suzukii* (Matsumura), a potentially devastating pest in Florida blueberries: Survey, trapping, and oviposition studies.** Lindsy Iglesias and Oscar Liburd. University of Florida, Bldg. 970 Natural Area Drive, Gainesville, FL 32611. liglesias@ufl.edu.

The spotted wing drosophila (SWD) *Drosophila suzukii* (Matsumura) is a serious threat to Florida's blueberry industry. Females oviposit under the skin of ripening fruit where larvae develop, rendering fruit unmarketable. A survey was conducted on 14 blueberry farms in 8 Florida counties from DeSoto in south-central to Suwannee in the north to determine SWD distribution. A trapping study was conducted on two farms to test the effectiveness of different trap designs baited with apple cider vinegar (ACV). Experiments were RCBD with 4 replicates. There were 5 treatments; 4 included a plastic cup and 1 a yellow sticky card. Among the 4 plastic cup treatments, 2 had yellow visual stimulants, one of which had detergent added to the

ACV. The last two cup treatments included one with a yellow sticky card hanging inside and a standard transparent cup (control). Oviposition behavior was also observed on different ripening stages of blueberries. Results of the survey detected SWD in all but two counties, DeSoto and Polk. Trapping results showed that the treatments with the yellow sticky card caught fewer flies than other treatments. In the oviposition study, SWD preferred dark blue berries, although some oviposition occurred on green and pink berries.

2:41

[14] **The evaluation of site-specific management for control of twospotted spider mites, *Tetranychus urticae* (Koch) in strawberries.** Ruohan Liu and Oscar. E. Liburd. Entomology and Nematology Department, University of Florida, Bldg. 970 Natural Area Drive, Gainesville, FL 32611. ruohan@ufl.edu

The effectiveness of site-specific management tactics was evaluated in strawberries (*Fragaria* × *ananassa* Duchesne) for control of the twospotted spider mite (*Tetranychus urticae* Koch). Both greenhouse and field experiments were conducted during 2011 to 2012 growing season. Five treatments were evaluated: site-specific treatment of a predatory mite, *Neoseuilus californicus* (McGregor); site specific treatment of a reduced-risk miticide, Acramite ®50WP (bifenazate); entire-field (plot) treatment of *N. californicus*, entire-field (plot) treatment of Acramite®, and untreated control. All treatments were arranged in a completely randomized block design with 4 and 3 replicates for field and greenhouse experiment, respectively. In the greenhouse study, all treatments significantly reduced the mite population compared with the control based on both motile and egg numbers. In field plots, site-specific treated Acramite® had significantly less motiles and eggs compared with all treatments at mid-season except site-specific treated *N. californicus* during late season. Overall, all treatments had significantly more yield compared with the control, while there was no significant difference among Acramite®, site-specific Acramite®, and *N. californicus* as the top-yielding treatments. These results have indicated that site-specific treated *N. californicus* and site-specific treated Acramite ® can be potential alternatives to control twospotted spider mites in strawberries in Florida.

2:53

[15] **Description of molting process of *Coptotermes formosanus* Shiraki (Isoptera: Rhinotermitidae).** Lin Xing and Nan-Yao Su. Fort Lauderdale Research Center, Department of Entomology and Nematology, University of Florida, 3205 College Ave, Davie, FL. lxing@ufl.edu

Due to the cryptic behaviors, little is known about molting process of the Formosan subterranean termites. Before the initiation of ecdysis, overall activities of termites declined. When the ecdysis begins, termites remain motionless and the de-attachment of the cuticle initially starts from the last segment of abdomen. Nest mates usually assist the molting individual to finish the process, but most workers can also complete the process by themselves without the aids of nest mates.

3:05

[16] **The role of house fly behavior in resistance expression to QuickBayt.** Krista Seraydar and Phillip E. Kaufman. University of Florida, Entomology and Nematology Department, 970 Natural Area Drive, PO Box 110620, Gainesville, FL 32611. kseraydar@ufl.edu

The objective of this research was to examine the role and type of behavioral mechanisms that function in house fly, *Musca domestica* L., resistance to imidacloprid baits by performing five successive selections for increased QuickBayt® resistance within a previously imidacloprid-resistant fly strain. Mortality and behavior were observed through choice and no-choice bioassays of three post-selection generations to determine whether flies would consume the bait in the presence of an alternative food source. Mortality rates in choice containers decreased in post-selection flies as selections progressed. There were significant differences in mortality between choice and no-choice containers of males and females at each generation. There were no differences between the proportion of flies feeding on QuickBayt compared with sugar and thus, it is unlikely that the flies sensed something in the bait that caused them to avoid landing on the bait, eliminating repellency as a stimulus-dependent behavioral resistance mechanism. Differences in QuickBayt consumption and mortality between choice and no-choice containers provided strong support for the evolution of irritancy- or taste aversion-related behavioral resistance in house flies. The results of this study emphasize the importance of integrated pest management programs and the responsible rotation of insecticides.

End of Master's Competition

Break 3:17 - 3:40 - Gallery

2:00 - 4:30 PM - Amberjack room

Symposium: IPM IN URBAN LANDSCAPES (Manejo Integrado de Plagas en Paisajes Urbanos).

Organizer: Dr. Steven Arthurs. Translation to Spanish by Luis F. Aristizábal

2:00: Introduction

2:05

[17] **Post release behavior of convergent ladybeetles in the landscape,** Steven Arthurs, Robert Leckel**,** Mid Florida REC, University of Florida, Apopka, FL 32703

Wild-collected, *Hippodamia convergens*, are used in inundative biological control strategies throughout North America, but releases are plagued by rapid dispersal and fear of introducing disease. We present results of three years of experiments investigating the influence of several factors, i.e. prey (aphids), *methyl salicylate* lures and pre-release conditioning (feeding to change reproductive status), on ladybeetle behavior.

Comportamiento de coccinélidos después de su liberación en el paisaje urbanístico

Silvestre *Hippodamia convergens* colectado son usados en liberaciones inundativas como estrategias de control biológico a través de Norte América. Sin embargo, las liberaciones se ven afectadas por la rápida dispersión y el temor a la introducción de enfermedades. Se presentan resultados de tres años de experimentación, investigando la influencia de varios factores como acondicionamiento de la presa (áfidos), atracción al salicilato de metil y las condiciones antes de la liberación (alimentación para cambia el estado reproductivo), en el comportamiento de los coccinélidos.

2:20

[18] **Addressing difficult invasive whitefly problems in Palm Beach County, Florida.**
William L. Schall, Jr. Palm Beach County Extension, West Palm Beach, FL 33415.

Palm Beach County Florida, along with much of southeastern Florida has been experiencing an unusual number of relatively new and serious invasive insect problems. Approximately one to two new arthropods enter Florida each month. Most do not become serious pests. However, examples of some that have become difficult pest problems include Ficus Whitefly (*Singhiella simplex*), Rugose Spiraling Whitefly (Aleurodicus rugioperculatus) and Bondar's Nesting Whitefly (*Paraleyrodes bondari*). Weather patterns over the past two years seem to have also contributed to higher than normal landscape insect pest problems. Management of these pests in the landscape has also been difficult because a relatively complex and expensive series of measures must be undertaken for successful suppression. University of Florida research has generated adequate management recommendations. However, communication of recommendations has been challenging, with somewhat limited adoption by pest management professionals and residents. Variability in site conditions has further complicated successful application of recommendations. The Palm Beach Whitefly Task Force was formed in 2011 to address these issues by providing accurate and scientifically based through a variety of methods. Examples include a website and blog, workshops, site visits and presentations, other electronic media and news articles.

Abordando los difíciles problemas de las moscas blancas invasoras en el condado d Palm Beach, Florida

El Condado de Palm Beach in Florida junto con gran a gran parte del sur oriente de Florida ha estado experimentando un inusual numero relativamente nuevo de serios e invasivos insectos plagas. Aproximadamente, uno a dos nuevos artrópodos entra a Florida cada mes. La mayoría no llegan a ser serias plagas. Sin embargo, ejemplo de algunos que han sido problemática plagas incluyen la Mosca Blanca de los Ficus, (*Singhiella simplex*), la Moscas Blancas de los Espirales Rugosos, (Aleurodicus rugioperculatus) y la Mosca Blanca de la Anindacion de Bondar, (*Paraleyrodes bondari*). Los patrones climáticos durante los dos pasados años también ha contribuido con el alto incremento de insectos plagas en los paisajes. El manejo de esos insectos plagas también ha sido difícil debido a una serie relativamente compleja y costosa de medidas que se deben llevar a cabo para el éxito del control. La investigación de la Universidad de Florida ha generado adecuadas recomendaciones de manejo. Sin embargo, la comunicación de las recomendaciones ha sido un reto, con la limitada adopción por parte de profesionales del

manejo de plagas y residentes. La variabilidad de las condiciones del lugar ha complicado aún más la correcta aplicación de las recomendaciones. El Grupo de Trabajo de la Mosca Blanca de Palm Beach se formo en 2011 para abordar estos problemas, proporcionar científica exacta a través de una variedad de métodos. sitio Los ejemplos incluyen un sitio en un pagina de la Internet, talleres, visitas, presentaciones y otros medios electrónicos y nuevos artículos.

2:35

[19] **Scale and mealybug control in urban landscapes in Florida.** Scott Ferguson**,** Atlantic Turf & Ornamental Consulting, Vero Beach, FL 32968.

Current methods for the control of the common scales and mealybugs in urban landscapes in Florida, with an emphasis on selective insecticides to preserve or minimize the effects on natural enemies, will be discussed.

Control de escamas y cochinillas en el paisaje urbano de Florida

Los métodos actuales para el control de escamas y cochinillas comunes en el pasaje urbanístico de Florida, con énfasis en insecticidas selectivos para preservar o minimizar los efectos en enemigos naturales, serán discutidos.

2:50

[20] **Four against one: Biological control of the Cycad Aulacaspis scale.** Ron Cave. Indian River REC, University of Florida, Ft. Pierce, FL 34945

The cycad aulacaspis scale, *Aulacaspis yasumatsui* Takagi (Hemiptera: Diaspididae) has invaded Florida for 15 years, and homeowners, urban landscape managers, and nurserymen continue to be exasperated by the loss of their highly valued plants. Moreover, the scale is destroying native cycads in Guam. Three natural enemies of the cycad aulacaspis scale in Florida are reviewed. *Cybocephalus nipponicus* Endrody-Younga (Coleoptera: Cybocephalidae) and *Coccobius fulvus* Compere and Annecke) (Hymenoptera: Aphelinidae) were released in Florida in 1998, although *C. nipponicus* was already present in the state. *Rhyzobius lophanthae* (Blaisdell) (Coleoptera: Coccinellidae) has been seen at only two sites in the state. These three natural enemies are not adequately controlling the pest in Florida, but *R. lophanthae* appears to be having some effect on scale populations in Guam. Results of foreign exploration in Asia for new natural enemies are presented, with a discussion of the biology and prey range of *Arrhenophagus chionaspidis* Aurivillius (Hymenoptera: Encyrtidae), *Aprostocetus purpureus* (Cameron) (Hymenoptera: Eulophidae), and a new species of lady beetle in the genus *Phaenochilus* (Coleoptera: Coccinellidae) discovered in Thailand. The development rates of *C. nipponicus, R. lophanthae, C. fulvus*, and *Phaenochilus* n. sp. are compared to that of *A. yasumatsui*.

Cuatro contra uno: Control biológico de la escama de las Cicadas *Aulacaspis yasumatsui*

La escama de las cicadas, *Aulacaspis yasumatsui* Takagi (Hemiptera: Diaspididae) ha invadido Florida desde hace 15 años, y los propietarios de casas, los jefes de pasajes urbanos y las personas de los viveros continúan siendo irritados por las perdidas de sus valoradas plantas. Por otra parte, la escama esta destruyendo las cicadas nativas en Guam. Tres enemigos naturales de la escama de las cicadas son revisados. *Cybocephalus nipponicus* Endrody-Younga (Coleoptera:

Cybocephalidae) and *Coccobius fulvus* Compere and Annecke) (Hymenoptera: Aphelinidae) fueron liberados en Florida en 1998, a pesar que *C. nipponicus* estaba previamente presente en el estado. *Rhyzobius lophanthae* (Blaisdell) (Coleoptera: Coccinellidae) se ha visto solamente en dos sitios del estado. Esos tres enemigos naturales no están controlando adecuadamente esta plaga en Florida, pero *R. lophanthae* parece estar teniendo algún efecto en las poblaciones de la escama en Guam. Resultados de explotaciones extranjeras en Asia de nuevos enemigos naturales son presentados, con discusión de su biología y rango de presas de *Arrhenophagus chionaspidis* Aurivillius (Hymenoptera: Encyrtidae), *Aprostocetus purpureus* (Cameron) (Hymenoptera: Eulophidae) y una nueva especie de coccinélido del genero Phaenochilus (Coleoptera: Coccinelidade) descubierta en Tailandia. Las tasas de desarrollo de *C. nipponicus, R. lophanthae, C. fulvus* y *Phaenochilus* n. sp. son comparadas con las de *A. yasumatsui*.

IPM IN URBAN LANDSCAPES Continued

3:05

[21] **South Florida Landscape Pests – How the public deals with new insects.** Adrian G. B. Hunsberger**.** University of Florida/Miami Dade County Extension, 18710 SW 288th Street, Homestead, FL 33030

Southeast Florida is ground zero for the introduction of new species into the U.S. Over the past 10 years, several new insect species have caused significant damage, both economically and aesthetically, to landscape plants and natural areas. Many of these pests have now spread throughout south Florida and elsewhere. All too often the public overreacts, including professional landscape pest management personnel. The public's perception of insect pests is that they all cause property damage or are a threat to plant, animal or human health. One of most serious overreactions is the removal of trees that are infested with whiteflies. People view all whiteflies as capable of killing plants and will treat infestations with whatever chemical that is available, even those that are illegal to use in landscapes or fruit trees. There is little patience when cars and plants are covered in honeydew and sooty mold, and swimming pools covered in whitefly flocculence. Another issue is the overuse and inappropriate use of pesticides which can cause environmental damage as well increasing the risk insecticide resistance. The lay audience is easily confused with pesticide information, are unable to distinguish the difference between serious pests and minor pests, and often seek guidance from non-research based sources of information or from untrained "experts".

Plagas del paisaje del Sur de Florida – Como es la oferta publica con nuevos Insectos

El sur oriente de Florida es la zona cero para la introducción de nuevas especies dentro de los E.U. En los últimos 10 anos, varias nuevas especies de insectos han causado danos significantes tanto económicamente como estéticamente, en las áreas naturales y en las plantas del paisaje. Muchas de esas plagas ahora se han dispersando en el sur de florida y en otros lugares. Con demasiada frecuencia hay reacción exagerada, incluidos los profesionales del manejo de plagas de los paisajes

La percepción publica de los insectos plagas es que todos ellos causan danos a las propiedades o son una amenaza para salud de plantas, animales y humanos. La gente ve todas las moscas blancas como capaces de matar las plantas y trataran las infestaciones con cualquier insecticida que este disponible, incluso aquellos que son ilegales para el uso paisajes y en árboles frutales. Existe poca paciencia cuando los carros y las plantas son cubiertos por gotas de miel y el hongo fumagina y cuando las piscinas son cubiertas por la abundancia de moscas blancas. Otra situación es el uso exagerado e inapropiado de pesticidas los cuales pueden causar daños ambientales como también incrementar el riesgo de la resistencia a insecticidas. El publico no especializado se confunde fácilmente con l información de pesticidas, son incapaces de distinguir entre las plagas serias y las de menor importancia y a menudo buscan la guía de fuentes no basadas en la investigación de información o en “expertos” no entrenados.

3:20 - 3:35 - Break - Gallery

3:35

[22] **Arthropods in *Heliconia* sp. in Colombia: Pests, beneficials and pest management Trends.** Luis F. Aristizábal, Kadya A. Ospina, Uver A. Vallejo, Efrain R. Henao, Misael Salgado & Steven Arthurs, Mid Florida REC, Apopka, FL 32703; University of Caldas, Manizales - Colombia

In the Central Coffee Region in Colombia, 40 farms producing *Heliconia* sp. flowers were surveyed for both pests and beneficial insects on *Heliconia* sp. plantations. Farmers were questioned regarding their pest management practices. In total, 475 individual phytophagous insects were collected and classified on 11 orders, 73 families, 57 genders, and 66 species. 36.4% of the phytophagous were Hemiptera, 21.4% Coleoptera, 21,05% Hymenoptera, 5.93% Diptera, and 4.0% Lepidoptera. In relation with natural enemies, 288 beneficial insects were collected and classified from 10 orders, 48 families, 43 genders, and 102 species. 29.8% of beneficial insects were Diptera, 28.4% Coleoptera, 12.5% Neuroptera, 9.7% Hymenoptera, 6.5% Hemiptera, and 2.7% Dermaptera. We found that 90% of farmers used the following insecticides, chlorpyrifos, carbofuran, and acephate, and just 35% of them applied biological control agents such as *Beauveria bassiana, Metarhizium anisopliae* and released *Chrysoperla* sp. In order to minimize negative impacts on beneficials, *Heliconia* sp. farmers should be trained to implement IPM with emphasis on cultural practices and biological control agents.

Artrópodos en *Heliconia* sp en Colombia: Insectos plagas, benéficos y tendencias del manejo de plagas

En la Región Central Cafetera de Colombia, 40 productores de flores de *Heliconia* sp fueron encuestados por ambos insectos plagas y benéficos presentes en los cultivos de *Heliconia* sp. Los productores fueron cuestionados con respecto a sus prácticas del manejo de plagas. En total, 475 individuos fitófago fueron colectados y clasificados en 11 ordenes, 73 familias, 57 géneros y 66 especies. 36.4% de los fitófago fueron Hemiptera, 21.4% Coleoptera, 21.05% Hymenoptera, 5.93% Diptera y 4.0% Lepidoptera. En relación con los enemigos naturales, 288 insectos benéficos fueron colectados y clasificados en 10 órdenes, 48 familias, 43 géneros y 102 especies. 29.8% de los insectos benéficos fueron Diptera, 28.4% Coleoptera, 12.5% Neuroptera, 9.7% Hymenoptera, 6.5% Hemiptera y 2.75% Dermaptera. Nosotros encontramos que el 90% de los

productores usa los siguientes insecticidas clorpirifos, carbofuran y acetato y solo el 35% de ellos aplica agentes de control biológico como Beauveria bassiana, Metarhizium anisopliae y libera Chrysoperla sp. En orden de preservar y minimizar el impacto negativo a los agro ecosistemas, los productores de *Heliconias* sp. deberían ser entrenados en como implementar un manejo integrado de plagas MIP con énfasis en practicas culturales y en agentes de control biológico en ves de aplicaciones generalizadas de insecticidas.

3:50

[23] **IPM of pest mole crickets.** Howard Frank and Norm Leppla, Entomology & Nematology Dept., Univ Florida, Gainesville, FL 32611

Due to area-wide biological control, pest mole crickets are far less of a problem in Florida than they were in the 1980s. Large flights of adults in early spring are a memory of the past. Control strategies for the small populations that still exist here and there can be based on IPM. At any given site, first, are there enough mole crickets to bother with? If you cannot detect any at all, do not apply a chemical against them because memories of the distant past are a poor guide to current status. Second, can biological control be enhanced onsite enough that no further action is needed? Third, in high-value turf where control is urgent, what chemical(s) can be applied to minimize disruption to the biological control that exists?

Maniego integrado de plagas del grillo topo

Debido a la amplia gama del control biológico, los grillos topo están distantes de ser un problema en Florida de lo que fueron en la decada de 1980. Grandes vuelos de adultos al inicio de la primavera son un recuerdo del pasado. Estrategias de control para las pequeñas poblaciones que aun existen aquí pueden ser basadas en MIP. Primero, en cualquier lugar determinado, existe suficiente grillos topos como para preocuparse?. Si usted no puede detectar ninguno de ellos, no aplique insecticidas contra ellos porque las memorias del pasado lejano son una guía pobre frente al estado actual. Segundo, puede ser mejorado en el sitio el control biológico lo suficiente para no sea necesario mas acciones de control?. Tercero, en céspedes de alto valor donde el control es urgente, que insecticidas puede ser aplicado para minimizar la interrupción en le control biológico existente?.

4:05-4:30 **- Discussion**

End of Symposium

3:30 - 5:35 PM - Pompano room

Ph.D. Student Competition

Dan Hahn, Student Activities Committee Chair, Department of Entomology and Nematology**,** College of Agriculture and Life Sciences**,** The University of Florida**,** P.O. Box 110620**,** Gainesville, Fl 32611-0620 dahahn@ufl.edu.

3:30 Introduction

3:35

[24] **Nematodes associated with fecal carton in the subterranean termite *Coptotermes formosanus.*** Paul M. Bardunias, Robin M. Giblin-Davis, and Nan-Yao Su. Fort Lauderdale Research and Education Center, 3205 College Ave. Davie, FL 33314. paulmb@ufl.edu

The fecal lining of subterranean termite tunnels is known to support a rich microbial community, including both bacteria and fungi. The use of feces, wood, and cuticular remnants of dead termites in constructing the lining of tunnels may represent a preadaptation to fungal gardening, of the type seen in Macrotermes species, by proving a niche for opportunistic fungal infestation. Nematodes have been shown to make up an important component of the mutualism between fungus and bark beetles, which shares many features of the termite-fungus symbiosis. Although nematodes have been known to interact with termites as parasites and commensals for over a century, no mutualistic relationship has been demonstrated. The nematode groups present in *Coptotermes formosanus* carton represent putative bacterial feeders (Rhabditida), mycophages (Aphelenchida), and what may be a predatory Diplogasterid. The nematodes may be commensals, using the termites solely for transport to fresh carton sites and providing no benefit to the termites, but they may play a role in the maintenance of bacterial and fungal populations within termite tunnels by grazing beneficial bacteria to keep the population in a logarithmic growth phase or suppressing fungal sporulation.

3:47

[25] **Acaricide resistance in Florida *Rhipicephalus sanguineus* populations**. Amanda L. Eiden, Phillip E. Kaufman, Faith M. Oi, and Robert Miller. Entomology and Nematology Dept., University of Florida, Gainesville, FL. aeiden@ufl.edu

The brown dog tick, *Rhipicephalus sanguineus* Latreille, is found worldwide as a common ectoparasite of dogs. This tick can complete its entire lifecycle indoors and infest homes. We have evaluated and confirmed permethrin and fipronil resistance in several Florida *R. sanguineus* populations and have developed a discriminating dose that can be used to screen ticks for resistance. This is the first time acaricide resistance has been documented in the United States. Preliminary results have demonstrated an increase in metabolic activity, which is known to aid in acaricide detoxification. Knowledge of resistance status and resistance mechanisms is crucial in developing a best management program for this tick.

3:59

[26] **Can twospotted spider mite damage on strawberry leaves be detected using visible/NIR reflectance spectroscopy?** T. W Nyoike, W. S. Lee and O. E. Liburd. Entomology & Nematology Dept, University of Florida, Gainesville, FL 32611. nyoiket@ufl.edu

The feasibility of visible/near infrared (Vis/NIR) reflectance spectroscopy to predict twospotted spider mite [TSSM] (*Tetranychus urticae* Koch) damage on strawberry leaves was investigated using spectral changes induced by TSSM feeding. Strawberry plants were artificially inoculated with TSSM at 0, 5, 15, and 25 mites per leaf, to achieve control, low, medium and high mite

infestation levels/leaf, respectively. At 14, 21 and 28 days after (TSSM) inoculation, strawberry leaf reflectance were scanned from wavelengths 200 to 2500 nm using a spectrophotometer. Two experiments were conducted in a greenhouse and a total of 94 and 128 leaves were scanned during the spring of 2011 and 2012, respectively. Twospotted spider mite damage on the leaves was classified into damage categories and TSSM numbers were predicted using the Partial Least Squares (PLS) model from the spectral data. Damage classification results showed that 80, 70, and 50 % in the categories of control, high, and low leaves were correctly classified. The best model for predicting TSSM numbers had a root mean square error (RMSE) of 17 mites per leaflet with an r^2 of 0.6 between predicted and counted mites. Low TSSM infestation levels had only 50% accuracy, which may not be desirable for detecting early/low TSSM infestation levels.

4:11

[27] **Investigating various tactics of intercropping buckwheat with squash to increase natural enemy populations, reduce pest and disease pressure, and increase yield .** Janine Razze and Oscar E. Liburd. University of Florida, Entomology and Nematology Department, Bldg. 970 Natural Area Drive PO Box 110620, Gainesville, FL 32611. jrazze@ufl.edu

The use of buckwheat as a living mulch intercropped with squash has shown promise to reduce pest and disease pressure while increasing the abundance of beneficial insects. This study evaluated several methods of intercropping buckwheat and squash, as well as introducing the natural enemy *Delphastus catalinae*, to find a tactic that reduces pest and disease pressure while increasing marketable yield. The five treatments evaluated include A) alternating buckwheat on either side of each squash bed; B) arranging buckwheat and squash in the same manner as treatment A, however, releasing *D. catalinae* into the plot; C) planting buckwheat in the center of the bed with squash planted on both sides; D) arranging buckwheat and squash plants in the same manner as treatment C, however, releasing *D. catalinae* into the plot; and E) planting buckwheat on both sides of the squash (control). We found aphid densities were highest in treatment C, however there was no significant difference in whitefly densities among treatments. Virus incidence was highest in treatments A and E, however marketable yields were also highest in treatments A and E. There was no significant difference in parameters among treatments when considering the influence of *D. catalinae*.

4:23

[28] **Suitability of Asian citrus psyllid *Diaphorina citri* (Hemiptera: Psyllidae) and corn leaf aphid *Rhopalosiphum maidis* (Hemiptera: Aphididae) as prey for the two-spotted ladybeetle *Adalia bipunctata* (Coleoptera: Coccinellidae)**. Azhar A. Khan, Jawwad A. Qureshi, Muhammad Afzal and Philip A. Stansly. University of Florida IFAS/SWFREC, Immokalee, FL 34142. azharkhan@ufl.edu

The two-spotted ladybeetle, *Adalia bipunctata* is an important bio-control agent wide spread in crops and forests ecosystem all over the world; including Asia, Europe and North America. Predation on some aphids and mealy bugs has been examined, but there are no reports regarding *D. citri*, vector of huanglongbing or citrus greening disease. We tested preference of *A. bipunctata* for *D. citri* or *R. maidis* and evaluated development on these two species and frozen eggs of the flour moth *Ephestia kuehniella*. Both larvae and adults of *A. bipunctata* did not discriminate between *D. citri* and *R. maidis* and all three diets were equally suitable for

development with 90% or more survival rate. Preliminary results indicate that all three diets are also suitable for beetle reproduction.

4:35

[29] **Targeting juvenile hormone metabolic genes in the Asian citrus psyllid (*Diaphorina citri*) as a strategy to reduce the spread of citrus greening disease.** Evelien Van Ekert, D. Borovsky, C. A. Powell, R. D. Cave, R. T. Alessandro, R. G. Shatters, Jr. University of Florida , Indian River Research and Education Center, 2199 South Rock Road, Fort Pierce, FL 34945-3138, belgica@ufl.edu

Diaphorina citri Kuwayama, the Asian citrus psyllid (ACP), is a devastating citrus pest due to its transmission of a phloem-limited bacterial pathogen, *Candidatus Liberibacter asiaticus* Jagoueix, that causes citrus greening. Psyllid control is a major part of effective greening disease management, and our research targets perturbation of insect juvenile hormone metabolism as a new psyllid control strategy. Application of a juvenile hormone (JH) analogue, pyriproxyfen, is known to produce ovicidal/nymphicidal effects, morphological abnormalities, and reduced fecundity in ACP adults. These observations prompted us to identify JH biosynthetic and degradative pathways as targets for biologically-based control strategies, including RNA interference, as alternatives to heavy reliance on broad-spectrum pesticides. First, candidate genes/cDNAs encoding the JH metabolic enzymes, juvenile hormone acid methyl transferase (JHAMT) and juvenile hormone esterase, were identified through computational analysis of the *D. citri* genome. Second, JHAMT cDNA was cloned, expressed in *E. coli* and a functional protein was purified. This JHAMT had a high affinity for substrates leading to JHI and JHIII synthesis, making it plausible that both juvenoids are present in the ACP. Results are discussed with respect to mechanism(s) of juvenile hormone biosynthesis/catabolism in the ACP and targeting this process as an interdiction point for ACP control.

4:47

[30] **Transgenic citrus strategies for control of the citrus weevil, *Diaprepes abbreviatus* (Coleoptera: Curculionidae)**. Sulley K. Ben-Mahmoud. University of Florida- IRREC, 2199 South Rock Road, Ft. Pierce, FL 34945. sbenmudi@ufl.edu

Diaprepes abbreviatus (L.), still threatens the citrus industry in Florida since its arrival in the early 1960s and has recently spread to Texas and California. Long-lived larvae cause the most damage. Losses in yield due to death of trees from larval root feeding are exacerbated by pathogenic bacteria and fungi that enter the plant through feeding damage sites. Attempts at controlling the pest with biological and chemical methods have only achieved limited success and novel techniques are still needed. Thus, a transgenic citrus rootstock approach is proposed. *Diaprepes abbreviatus*-resistant citrus rootstock, available for grafting to non-transgenic fruiting cultivars, will provide a cost-efficient management of the pest using a scion that produces non-transgenic fruit grafted onto a transgenic rootstock. It is now possible to manipulate citrus to synthesize molecules selectively toxic to *D. abbreviatus* in a pyramiding/stacking strategy to delay the onset of resistance. A *Bacillus thuringiensis* (Berliner) toxin active against *D. abbreviatus*- *Cyt2Ca1*, a cysteine proteinase inhibitor, and double-stranded RNA molecules targeting genes encoding essential *D. abbreviatus* genes are being evaluated as potential control agents. Studies with *Cyt2Ca1* transgenic citrus have advanced following preliminary studies

using transgenic alfalfa expressing*Cyt2Ca1* as a model plant which shows resistance against larval feeding.

4:59

[31] **Life cycle, development and culture of *Xyleborus glabratus* (Coleoptera: Curculionidae: Scolytinae).** Gurpreet S. Brar, John. L. Capinera, Stephen. McLean and Jorge. E. Pena. University of Florida, Entomology and Nematology Department, Bldg. 970 Natural Area Drive PO Box 110620, Gainesville, FL 32611. gpsbrar@ufl.edu.

The redbay ambrosia beetle, *Xyleborus glabratus* Eichhoff (Coleoptera: Curculionidae: Scolytinae) vectors the fungus *Raffaelea lauricola* that causes laurel wilt disease in trees of the family Lauraceae. The life cycle and development of *X. glabratus* were studied in logs of three natural hosts: avocado (*Persea americana*), redbay (*Persea borbonia*) and swampbay (*Persea palustris*) at 25±2° C. Mean ± SD for duration of the egg, larval, and pupal stage was 6.6 ± 2.5, 9.3 ± 3.0, and 5.0±1.4 respectively. Mean ± SD for pre-oviposition period was 9.3 ± 2.0. Similar developmental patterns were observed in the three hosts. Following artificial inoculations in the laboratory greater numbers of all developmental stages of beetle were found in the swampbay followed by redbay and avocado. Three larval instars were observed in all three hosts, with head capsule widths of 0.20–0.22, 0.25–0.27, 0.35–0.40 mm respectively for instars 1-3. *Xyleborus glabratus* was successfully reared on soaked swampbay logs and about 2.8 times as many female adults emerged from each log as were inoculated with emergence continuing for about 240 days and maximum emergence taking place between 120-150 days after gallery initiation.

5:11

[32] **Thermal requirements and development of *Herpetogramma phaeopteralis* (Lepidoptera: Crambidae: Spilomelinae)**. Nastaran Tofangsazi, Eileen A. Buss, Robert Meagher, GabrielL M. Mascarin and Steven P. Arthurs. Mid Florida Research and Education Center, University of Florida, 2725 Binion Road, Apopka, FL 32703. ntsazi@ufl.edu

The tropical sod webworm, *Herpetogramma phaeopteralis* Guenée is a major turfgrass pest in the southeastern United States. We evaluated larval development on five artificial diets and at six temperatures (15, 20, 25, 30, 32.5, 35 ±1 °C) on St. Augustinegrass [*Stenotaphrum secundatum* (Walter) Kuntze]. Only individuals fed on St. Augustinegrass and soy-wheat germ diets were able to complete their lifecycles. None of artificial diets tested (corn-based, soy-wheat germ, corn cob-wheat germ, corn cob-soy flour, or Pinto bean) were suitable for rearing this species, due to high mortality and slower developmental time. The total developmental time (from oviposition to adult) *on S. secundatum* significantly decreased from 47.8 d at 20°C to 21.1 d at 30°C, and then increased to 32.6 d at 32.5°C. The relationship between temperature and developmental rate was described using two linear (common and polynomial) and two nonlinear models (Briere-1 and Briere-2). The Briere-1 model provided the best fit with estimated lower, upper and optimum thresholds for total development of 14.9, 34.3 and 29.4°C, respectively. The developmental requirements of *H. phaeopteralis* can be used to help predict the distribution and seasonal phenology of this pest.

5:23

[33] **Metalized Polyethylene Mulch to reduce incidence of huanglongbing and improve growth of new citrus planting.** Scott Croxton and Philip Stansly. University of Florida/IFAS Southwest Florida Research and Education Center, 2685 SR 29 N, Immokalee, FL 34142. croxtsd@ufl.edu.

Polyethylene mulch was evaluated for deterring colonization by Asian citrus psyllid (ACP) *Diaphorina citri*, reducing incidence of huanglongbing (HLB) or citrus greening disease and accelerating growth of young citrus. UV reflective low density polyethylene mulch metalized with aluminum, low density whitefaced polyethylene mulch and bare ground all using drip irrigation in a randomized complete block design were tested and compared to the current grower standard using micro-sprinkler irrigation with four replications located at the Southwest Florida Research and Education Center in Immokalee, FL. Populations of ACP and other arthropods were monitored on new flush while ACP movement was monitored using yellow sticky cards. Incidence of HLB was evaluated twice during the 20 month study period using qPCR. Trunk cross sectional area, soil moisture, and surrounding weed biomass were also monitored. Metalized mulch reduced pest populations and HLB incidence compared to all tested alternatives. In addition, metalized mulch increased tree growth and soil moisture while reducing weed pressure. Results of this study present a good case for the use of metalized plastic mulch for young citrus plantings.

5:35 ***End of Ph.D. Student Competition***

Tuesday, July 24

8:00 – 5:00 - Bonito room

OFFICE/PRESENTATION PREVIEW - Collection of Presentations -

8:00 – 5:00 - Gallery

REGISTRATION - *Registration Desk*

Tuesday, 8:00 AM - 5:00 PM - Marlin room

Poster Session 2

[DSP 9] **Temporal study of sub-populations of the exotic arboreal termites *Nasutitermes corniger* using DNA-fingerprinting technique**. Seemanti Chakrabarti and Rudolf Scheffrahn. University of Florida, FLREC, 3205 College Ave., Davie, FL-33314. seemanti@ufl.edu

Nasutitermes corniger is an exotic arboreal termite endemic to the Neotropics and an economically important structural pest. This termite was first discovered in the United States in Dania Beach, Florida, in May 2001, and was estimated to have been established for 5-8 years. Due to the proximity of the infested area to near marine dockage it is assumed to have arrived shipboard from an unknown location in the Caribbean Basin. This termite species was almost eradicated by 2004. However, a few sub-populations have re-surfaced in the vicinity of previous infestations in the past few months. In order to understand the dynamics of exotic termite introductions, a study using polymorphic microsatellite markers was conducted. This was a step in understanding whether the new colonies are closely related to the members of the previous colonies or not. Termite specimens were collected from various infestation sites in Dania Beach and preserved. Comparison of individuals from these subpopulations for their microsatellite loci estimated the population structure and potentially also the parentage of the colony. Furthermore, percent polymorphism, number of alleles per locus, and comparison between observed and expected heretozygosites were made.

[DSP 10] **Increasing communication between school personnel and neighboring agricultural landowners with Good Neighbor Practices (GNPs).** Jennifer Gillett-Kaufman, Steven Lands, David Dinkins, and Faith Oi. UF/IFAS Entomology & Nematology Department, PO Box 110620, Gainesville Florida 32611-0620. gillett@ufl.edu.

Since urbanization has increased the number of schools in proximity to agricultural lands, there have been several high profile reports concerning pesticide drift and schools. The Good Neighbor Practices (GNPs) Program was developed to reduce the risk of pesticide drift exposure for children at school and to increase communication between school personnel and neighboring agricultural landowners. In this project we surveyed Florida schools and neighboring agricultural landowners to determine and document if pesticide drift was perceived as a problem for the schools and how the distance between the schools and the agricultural operations affected this perception. We also documented what, if any GNPs were already being employed. Only 2 schools out of 727 schools that responded, reported pesticide drift as an issue with a neighbor. Both of the schools who had reported incidents suggested that they had a positive relationship with their neighbor and were able to resolve the issue with little interference to school or agricultural activities. Our data are supported by the low number of complaints received by Florida DACS pesticide surveillance. A brochure and a CEU course were developed based on the results to help schools and neighbors develop communication plans.

[DSP 11] **Biodiversity and community structure of arthropods associated with *Salvinia minima* Baker. Katherine A. Parys and Seth J. Johnson.** Department of Entomology, Rm 404 Life Sciences Bld, Louisiana State University, Baton Rouge, LA 70803, sjohnson@agcenter.lsu.edu

The presence of common salvinia, *Salvinia minima* Baker, in addition to other aquatic invasive plants has changed the landscape of swamps in southern Louisiana. These densely packed aquatic plants form floatants, a unique habitat which changes in structure over time. Adult insects associated with floating vegetation were sampled during 2009 and 2010 using floating pitfall traps. We collected a total of 231 species representing 69 families across 7 orders, including four previously undescribed species and three new state collection records.

[DSP 12] **Cuban brown snail, *Zachrysia provisoria*, in Florida.** John L. Capinera. Box 110620, Entomology and Neematology Dept, University of Florida, Gainesville, FL 32611. Capinera@ufl.edu.

Zachrysia provisoria (Pfeiffer, 1858) was originally described from Cuba, but now occurs on many islands in the Caribbean as well as Florida, Guatemala, and Costa Rica. In Florida, *Z. provisoria* has become the major snail pest of landscape plants, occurring widely in southern regions of the peninsula. However, it is virtually unstudied. Specimen-based distributional records for Florida show that it is found predominately in southern Florida, and mostly in coastal locations. Snails attained a stable weight of about 10-12 g in about 120-130 d, suggesting maturity, but required an additional 10-30 d to mate and produce eggs. Eggs, deposited in clusters of about 40, required about 20-30 days to hatch. Thus, a complete generation could be completed in about 6 months. Foliage consumption increased with age (weight). At 24°C, individuals nearing maturity could consume an average of 40 cm^2 of lettuce leaf area/day, but less at 32°C. Young snails ate proportionally more foliage (cm^2 foliage/g snail) when young, with the rate of consumption diminishing with age. Five molluscicide-containing baits were effective at inducing mortality. Metaldehyde-containing baits induced mortality sooner than baits containing iron phosphate, sodium ferric EDTA, and orthoboric acid. Most baits significantly reduced foliage consumption immediately after treatment.

[DSP 13] **Chemical control of the redbay ambrosia beetle.** Daniel Carrillo, Jorge E. Peña, Rita Duncan and Jonathan Crane. University of Florida, Tropical Research and Education Center, Homestead FL., 18905 SW 280 ST, Homestead, FL, 33031. dancar@ufl.edu.

The lethal concentration (LC 90) of 12 commercial insecticides to the Red Bay Ambrosia Beetle (RAB), *Xyleborus glabratus* Eichhoff (Coleoptera: Curculionidae: Scolytinae) was determined. Tested pesticides include different formulations of Bifenthrin, Fenpopathrin, Thiamethoxam, z-cyperthetrhrin + bifenthrin, Methomyl, Chlorpyriphos, Malathion, Permethrin and Carbaryl. Four concentrations of each insecticide were tested (0.5, 0.1, 0.025, 0.005 of the recommended label concentration) and water was used as the control. Probit analysis was used to determine the LC 90. The lethal concentrations were used to compare the toxicity of the pesticides and select six pesticides to test their persistence under field conditions. Commercial formulations of Bifenthrin, Fenpopathrin, Thiamethoxam, z-cyperthetrhrin + bifenthrin, Malathion and Permethrin were applied to avocado trees in a commercial grove. Limbs of treated trees were cut weekly after the application and exposed to RAB to determine if beetles could bore into the logs.

In general, the toxicity of pesticides to RAB is greatly reduced two weeks after their application. Among the pesticides registered for use in avocado, Fenpopathrin and Malathion showed the better results protecting trees from attack by RAB. Other pesticides that are currently not registered for use in Avocados could be useful for managing this beetle.

[DSP 14] **The life table of *Trissolcus vassilievi* Mayr (Hym.:Scelionidae) on Sunn Pest, *Eurygaster integriceps* Puton (Hem.:Scutelleridae)** Farzaneh Kazemi Yazdi & Asieh Abolhassani**.** Agricultural Department, Shahre-Rey University, Tehran, Iran.

Egg parasitoids are the most important natural enemies of Sunn Pest, *Eurygaster integriceps* Puton (Hem.:Scutelleridae). Sunn pest eggs are attacked most commonly by *Trissolcus vassilievi* Mayr (Hym.:Scelionidae) at least in the different parts of Iran. In this study Sunn pest eggs were used for (0-4 h) as the host under controlled conditions at 25±1 °C, 65±5% relative humidity, and 16L: 8D photoperiod. Development of immature stages took 12.29±0.1 days, adult females lived for 20.7±1.94 days, and mean number of egg laid per female was 234.3±21.52 egg/female. Results of the age specific fecundity and life table statistics under laboratory conditions are as follow: the net reproductive rate (R_0), 197.13 female/female, the intrinsic rate of increase (r_m) 0.336 day^{-1}, the finite rate of increase (λ) 1.34 female per day, generation time (T) 15.74 days and population doubling time (DT) 2.07 days. These statistics suggest that parasitoids may be an effective agent as it has the potential to multiply much faster than its host.

[DSP 15] **Florida State 2012 Science and Engineering Fair Florida Entomological Society Award Winner. Effects of pheromones on *Diaprepes* root weevils.** Evan C. MacKay. Vero Beach High School, 1707 16th Street Vero Beach FL 32960.

Citrus canker is a disease that enters through damaged roots, and the *Diaprepes* root weevil in its pupae state is the organism that eats the most roots and may be a vector. I have tried to see if male weevils produce a pheromone in their frass. I put plants that have been fed upon by males so the frass and potential pheromone are there with plants that were fed upon by females to see where males would choose to go. The males didn't prefer either side, so there wasn't a pheromone for the males. I tested males choosing between plants that males have fed with other male FUF (fed upon flush) on as a control. Still, the males had no preference. Females were tested choosing between male FUF and female FUF, and they chose male FUF by a 3:1 margin, indicating that there is an attractive pheromone in the male frass. More controls were tested such as simulated plant damage to untouched plants to make sure a chemical released by feeding wasn't an attractant; it wasn't. Concluding, there is a pheromone in the male frass. This pheromone can now be isolated using a spectrometer, made synthetically, then put in the fields.

Tuesday, 8:00 AM-11:35 PM - Amberjack room

Symposium - Native or invasive: Florida harbors everyone!

Organized by: Vivek Kumar (Mid-Florida Research and Education Center, IFAS-UF), Seemanti Chakrabarti (Ft. Lauderdale Research and Education Center, IFAS-UF), Garima Kakkar (Ft. Lauderdale Research & Education Center, IFAS-UF)

8:00 Introduction

8:05

[34] **How to become a successful invader.** Nan-Yao Su. Department of Entomology and Nematology, Ft. Lauderdale Research and Education Center, IFAS, University of Florida. nysu@ufl.edu.

Rapid reproduction, fast growth, phenotype plasticity and ecological competence are often listed as the common traits among invasive species, but the ability to disperse through human traffics is an important factor for some species to become successful invaders. Of the over 2,800 termite species, for example, only a few has successfully traveled to and established in non-native lands. For species that can easily survive the dispersal phase, other factors may be more important. The case with the spread of Formosan subterranean termite, *Coptotermes formosanus* Shiraki, and problems associated with their management in non-native lands will be discussed.

8:20

[35] **Nematodes that ride insects: Unseen and unintended consequences of invading species.** Robin M. Giblin-Davis. Fort Lauderdale Research and Education Center, University of Florida-IFAS, 3205 College Avenue, Fort Lauderdale, FL 33314-7719, USA. giblin@ufl.edu

Insects that are introduced into southern Florida can potentially be hosts for a variety of unseen metazoans, including microscopic nematodes which are carried phoretically as dauer juveniles or as internal parasites in various stages. This includes insects or other invertebrates that are brought in as part of the pet trade. In some cases, the host associations are so specific that they pose little threat, but in other cases where host specificity is relatively wide, the nematode associates can transfer to native insects causing different potential downstream ecological effects. Because nematodes are mostly microscopic, the consequences of such introductions are usually not considered in the pet trade or as an added consequence as invasive insects arrive in the state and establish themselves. These two introduction scenarios will be discussed with real-world examples, including one with damage potential for Florida and the southeastern U.S.

8:35

[36] **Real time internet invasive pest identification training.** Robin M. Giblin-Davis and Amy L. Roda. Fort Lauderdale Research and Education Center, University of Florida-IFAS, 3205 College Avenue, Fort Lauderdale, FL 33314-7719, USA. giblin@ufl.edu. Early detection of potentially invasive pests is critical to avert significant economic and environmental damage that may result from their successful introduction and establishment in the U.S. Recent advances in affordable USB compliant digital microscope cameras and internet platforms for disseminating information in real time are creating the potential for enhanced training for insect pest identification. Using the palm weevil genus *Rhynchophorus* as a test group, we conducted preliminary local tests which suggested that remote identification training is possible with the U.S. government internet-based portal "FoodShield" which employs Adobe Connect software along with an open conference call line to reduce audio feedback. A training module was developed using easy to use keys with photographs of diagnostic characters for species of *Rhynchophorus* that were distributed with an observation kit (containing image capture software, a digital microscope, a stand, and a specimen holder) to remote participants along with number-coded but unidentified voucher specimens of *R. cruentatus*, *R. palmarum* and *R. ferrugineus*

prior to the training test. The screen-sharing features of the portal allowed each test participant to project back images of diagnostic features of their unknowns for confirmation that they were correctly identifying their voucher specimens.

8:50

[37] **Invasive termites in Florida: where did they come from and where on earth are they now?** Rudolf H. Scheffrahn**.** University of Florida**,** Fort Lauderdale Research & Education Center**,** 3205 College Avenue, Fort Lauderdale, FL 33314**.** rhsc@ufl.edu

The endemic origins, current distributions, and suspected dispersal mechanisms will be reviewed for all exotic invasive termite species known in Florida. These pest species include the West Indian and western drywood termites, (*Cryptotermes* sp. and *Incisitermes* sp., respectively), the Formosan and Asian subterranean termites (*Coptotermes* spp.), the tropical subterranean termite (*Heterotermes* sp.), and the arboreal termite (*Nasutitermes* sp.).

9:05

[38] **Using GIS for analyzing and predicting the spatial distribution of termites in Florida.** Hartwig Henry Hochmair. Fort Lauderdale Research and Education Center (FLREC), University of Florida, 3205 College Avenue, Fort Lauderdale, FL 33314-7799. hhhochmair@ufl.edu

A geographic information system (GIS) is a system designed to capture, store, manipulate, analyze, manage, and map spatial data. This presentation reviews basic GIS analysis procedures that can assist the analyst with determining spatial distribution patterns of termites and predicting termite dispersion within more complex prediction models. These GIS analysis procedures are illustrated within several showcases that describe observed and predicted spatial distributions of invasive termites in Southeast Florida.

9:20

[39] **Recent invasive pests affecting tropical fruits in Florida.** Jorge E. Peña, D. Carrillo, G. Brar, R. Duncan, J.H. Crane, A. Roda and L. Stelinski. Department of Entomology and Nematology, Tropical Research and Education Center, IFAS, University of Florida, 18905 SW 280th Street, Homestead, FL 33031. jepena@ufl.edu

Research on the exotic pests, *Raoiella indica, Xyleborus glabratus, Andaspis punicae* and *Zaprionus indianus* of tropical fruit and nuts, coconuts, *Cocos nucifera,* avocado, *Persea americana,* litchi, *Litchi chinensis* and longan, *Euphoria longan,* respectively, concentrated on determining their bio-ecology, host plant species and selected control tactics, i.e., chemical and biological control in Florida. Examples of other exotic pest species, i.e., orders Acarina, and Homoptera affecting Surinam Cherry, *Eugenia glabra* and, Hog Plum, *Spondias* spp., in Florida, are presented.

9:35

[40] **Who is eating your vegetables?** Dak Seal, Vivek Kumar and Garima Kakkar. University of Florida-IFAS, Tropical Research and Education Center, 18905, SW 280 St., Homestead, FL 33030. dseal3@ufl.edu

Florida is a unique home of immigrant and introduced insect species due to its conducive tropical and subtropical environment which supports bountiful of host plants consisting of fruits, ornamentals and vegetables. On an average, about one insect species establishes in Florida every five weeks. Their feeding damage inflicts serious threat to vegetable production as well as fruits and ornamentals. *Thrips palmi* Karny arrived in 1990 and has successfully established in the southern Florida. It attacks almost all vegetable crops rendering unbearable economic loss. During the last two decades' combat, it has overcome all known insecticide barriers and remains unchallenged as a vegetable pest. *Scirtothrips dorsalis* (Hood) is a recent addition to our ecosystem as an adventives pest that arrived in 2005. It is a pest of over 200 species of cultivated plants exerting serious loss to Florida's economy. In the present talk, research information will be provided to manage these two adventives insect pests of vegetable crops.

9:50

[41] **LAMP - a technique for biotype discrimination in *Bemisia Tabaci*.** Aaron M. Dickey**,** Lance S. Osborne**,** Robert G. Shatters, Jr. and Cindy L. McKenzie. USDA-Horticulture Research Laboratory, 2001 South Rock Road, Fort Pierce, FL 34945. aaron.dickey@ars.usda.gov.

Loop-mediated isothermal amplification of DNA (LAMP) can amplify a target DNA sequence at a constant temperature in about 1 hour. LAMP technology has great potential for agricultural applications because of the need for rapid and inexpensive diagnoses. Assays based on LAMP technology are well suited to the discrimination of economically important insects, particularly members of cryptic species complexes, which cannot be distinguished morphologically. We report ongoing work to develop a LAMP system that can discriminate among the invasive *Bemisia tabaci* Gennadius (Hemiptera: Aleyrodidae) biotypes B and Q. The ultimate goal of the project is a system that can be implemented in the field for on-site detection.

La amplificación isotérmica mediada en el lazo del ADN (LAMP) puede amplificar una secuencia de ADN objetivo a una temperatura constante en aproximadamente 1 hora. La tecnología de LAMP tiene gran potencial para aplicaciones agrícolas debido a la necesidad de diagnósticos rápidos y baratos. Los ensayos basados en la tecnología de LAMP convienen bien a la discriminación de insectos económicamente importantes, en particular miembros de complejos de especies crípticas, que no se pueden distinguir morfológicamente. Relatamos que el trabajo en curso desarrolla un sistema de LAMP que puede discriminar entre dos plagas invasoras - *Bemisia tabaci* Gennadius (Hemiptera: Aleyrodidae) biotipos B y Q. El objetivo del proyecto es un sistema que puede ser puesto en práctica en el campo.

10:05 - 10:20-Break - Gallery

10:20

[42] **Flies and pies: Florida's livestock pests**. Phillip E. Kaufman. Entomology and Nematology Department, PO Box 110620, University of Florida, Gainesville, FL 32611. pkaufman@ufl.edu.

Numerous pests attack Florida's livestock. As most livestock in the US were imported, many of their pests are often also invasive species. These include biting and non-biting flies, the "bot" flies, and lice. However, plenty of native species have taken advantage of the bloodmeal's provided by these large mammals. These include numerous species of ticks, mosquitoes, and other native biting flies, such as tabanids, black flies, and biting midges. This presentation will focus on the economically important biting and non-biting fly pests of cattle and horses. The house fly, stable fly and horn fly are the three most important pests of livestock across the United States. These flies are pestiferous in beef cattle, dairy cattle and equine operations, often causing direct and indirect economic losses. The horn fly and stable fly are particularly problematic as they blood feed multiple times per day, inflicting pain and distress upon their hosts. The house fly is principally a pest in confined operations, the horn fly in pasture-based operations, and the stable fly in both. Management of these pests is becoming more dependent upon IPM systems, as insecticide resistance, public health risks and increased recognition of fly dispersal continues to increase.

10:35

[43] **Invasive stinging Hymenoptera of Florida that can envenomate humans; ants, bees, and wasps.** Dr. William H. Kern, Jr. University of Florida / FLREC, 3205 College Ave., Davie, FL 33314. whk@ufl.edu

The majority of introduced exotic Hymenoptera do not sting and include introduced parasitoids imported to control exotic insect pests and many of the cosmopolitan or cosmotropical tramp ant species. Of the 316+ bee species found in Florida, only 5 species are exotic. The best known is the western honey bee, *Apis mellifera* (Apidae), especially the African subspecies, *A. m. scutellata*. Other species of introduced and established bees include a neoptropical oil collecting bee, *Centris nitida* (Apidae; Centrini), the giant resin bee, *Megachile sculpturalis* (Megachilidae), *Megachile lanata* (Megachilidae; Megachilinae) *Megachile rotundata* (Megachilidae), and a Neotropical orchid bee, *Euglossa viridissima* (Apidae; Euglossini). At least four exotic Vespidae have been reported in Florida including the European paper wasp, *Polistes dominula*, the introduced African potter wasp, *Delta rendalli*, and the Neotropical potter wasp, *Zeta argillaceum*. The European or giant hornet *Vespa crabro* (Vespidae) has expanded its range throughout the Eastern U.S since 1840 to finally reach Florida. Introduced stinging ants include the rough-node snapping ant, *Odontomachus ruginodis*, the Chinese needle ant, *Pachycondyla chinensis*, *Platythyrea punctata*, the elongate twig ant, *Pseudomyrmex gracilis*, the red imported fire ant, *Solenopsis invicta*, the black imported fire ant, *Solenopsis richteri*, and little fire ant, *Wasmannia auropunctata*.

10:50

[44] **The Division of Plant Industry's role in dealing with exotic pests.** Greg Hodges. Division of Plant Industry, 1911 SW 34th Street, Gainesville FL 32608. greg.hodges@freshfromflorida.com

Exotic arthropods and diseases are detected in Florida every year from various types of plant and product movement into the state. Some of these arthropods and diseases could be serious agricultural pests and require a quick response to attempt eradication. Sometimes eradication is not achievable and collaboration with researchers and extension personnel are required in dealing with the pest mitigation and control strategies. This presentation will cover some recent examples of the Division of Plant Industry's role in dealing with exotic pests in eradication efforts, established populations and permitting for researchers.

11:05-11:35 - Discussion

End of Symposium

Tuesday, 8:00 -9:40 AM - Pompano room

SYMPOSIUM: Careers in Industry

Organizers: Joe Eger (Dow AgroSciences, Tampa, FL) and Scott Ferguson (Atlantic Turf & Ornamental Consulting, Vero Beach, FL)

8:00 AM-Introduction

8:05

[45] **Roles, responsibilities, and qualifications to be a research and development scientist for the lawn and garden industry**. Bryan Delp, Syngenta Crop Protection, 2973 20th St. Vero Beach, FL 32960

The Field Development Representative position is considered by many to be the best job in the industry. This paper will discuss what education, skills and work ethic components are most highly valued by major agricultural chemical companies. Techniques on how to survive and thrive in the agricultural chemical industry will be discussed.

8:20

[46] **So, you want to be a Field Development Representative, huh.** John Paige, Bayer Environmental Science, 328 Indian Lilac Road, Vero Beach, FL 32963

An overview of the roles and contributions a Research and Development Scientist can make in the Lawn and Garden Industry is presented. Specific responsibilities and activities are described. Based on these, educational qualifications and practical experience to prepare for these roles are discussed.

8:35

[47] **Opening Doors - A career in industry** – James "Shine" Taylor, DuPont Crop Protection, 6922 Jamestown Manor Dr., Riverview, FL 33578

8:50

[48] **How to prepare for a career in private industry**. Melissa Willrich Siebert, Dow AgroSciences, 753 Highway 438, Greenville, MS 38701

9:05

[49] **A Decade of Plant Medicine.** J. Stacy Strickland, University of Florida, Hernando County Extension Service, 1653 Blaise Drive, Brooksville, FL 34601, and Gary L. Leibee, University of Florida, Mid-Florida Research & Education Center, 2725 Binion Road, Apopka, FL 32703.

9:20

[50] **Agricultural consulting: A career with many hats.** Galen Frantz, H. Charles Mellinger and Christian Miller, Glades Crop Care, Inc. 949 Turner Quay, Jupiter, FL 33458

9:35 - 9:45 - Discussion

End of Symposium

10:00 - 10:20 - Break Gallery

Tuesday, 10:30 - 12:00 PM - Pompano room

SYMPOSIUM: Your Apps, Your Data, Your Legacy--Modern Information Technology Resources in Entomological Context

Organizer: Richard Mankin, USDA-ARS Center for Medical, Agricultural, and Veterinary Entomology

10:30 - Introduction - Richard Mankin

10:35

[51] **Computer and mobile-based pest identification resources.** Amanda Hodges. Southern Plant Diagnostic Network, University of Florida/ IFAS Extension, Entomology and Nematology Department, Gainesville, FL.

The University of Florida/IFAS Extension has taken a lead role in content development and delivery of computer-based e-learning and mobile pest diagnostic resources. Specifically, matrix-based LUCID tools developed with USDA-APHIS-PPQ partners as well as NPDN and Protect U.S. e-learning and mobile applications will be discussed.

10:55

[52] **Introducing Windows 8; Microsoft's new touch-centric approach to computing**. Kevin Hill. Computer Coordinator, University of Florida/IFAS, Southwest Florida Research and Education Center, Immokalee, FL.

Due this fall, Microsoft's newest operating system features a radically different user interface heavily influenced by the company's tile-based Windows Phone 7 OS. Designed to work on a wide range of devices, from tablets and slates, to laptops, desktops, and all-in-ones, Windows 8 introduces a touch-based approach to accessing your apps, your data, and the information you care most about. This session will demonstrate the new "Metro" interface and some of the interesting features being introduced in Windows 8.

11:15

[53] **Defending against malware and other scams.** Steve Lasley. Senior Systems Programmer, University of Florida/IFAS Extension, Entomology and Nematology Department, Gainesville, FL

The combination of computer use and the Internet can put your privacy at risk from scammers from around the world. Controlling your computer resources and stealing your financial information is now big business. The bad guys are continually evolving new levels of sophistication and a naïve uninformed computer user can easily become a victim. Learn some simple steps you can take to keep your computer and yourself safer from such threats.

11:35

[54] **Legacy literature- a need for virtual libraries?** Richard Mankin. USDA-ARS Center for Medical, Agricultural, and Veterinary Entomology, Gainesville, FL.

After years of conducting, writing-up, and reviewing research, many entomologists have examined, organized, and annotated some as 2-3 gigabytes of pdfs and 4-5 file cabinets of hard-copy articles, in addition to thousands of spreadsheets, docs, jpgs, and wav files of data. This is a useful legacy that can be passed on to others, but there are few clear options on how the transfer can be accomplished most beneficially and efficiently. Are there ways to set up virtual libraries, perhaps in a "computer cloud," where this data can be stored and made accessible to all who find it of value? Or is it best to simply pass around a few flash drives and ride off into the sunset? In this session we will consider some of the previous and future options for legacy literature.

11:55 - Discussion ***End of Symposium***

Tuesday Afternoon

2:30 - 5:20 PM - Amberjack

Symposium: The friends and colleagues of Bob Heath consider insect traps and attractants

Organized by John Sivinski

2:30 PM

Introduction. John Sivinski.

2:35

[55] **Bob Heath, The man and the scientist.** Hernan Espinoza**.** Entomólogo, Fundación Hondureña de Investigación Agrícola, La Lima, Cortés, HONDURAS C. A. hernan_espinoza@fhia-hn.org

It is very likely that everyone attending this symposium is aware of Bob Heath achievements as a scientist: There are over 200 refereed publications and book chapters, nine patents and other significant achievements that can attest for his scientific contribution. However, very few of us may be aware of some of his personal attributes that might have influenced his scientific work. When he visited Honduras in 2007, I could perceive other aspects of his personality. For example, he was an enthusiastic, highly skilled woodworker, an indication of creativity with good perception for detail, an attribute that must have contributed to those patents granted to Bob. He was a man of firm beliefs that made him the straight forward and someone who provided positive leadership that gained him the respect of his immediate collaborators and the scientific community. I am certain that at the end of his life he came with a positive balance.

Es muy probable que todos los asistentes a este simposio es consciente de los logros de Bob Heath como científico: hay más de 200 publicaciones arbitradas y capítulos de libros, nueve de las patentes y otros logros importantes que pueden dar testimonio de su contribución científica. Sin embargo, muy pocos de nosotros pueden ser conscientes de algunos de sus atributos personales que podrían haber influido en su trabajo científico. Cuando visitó Honduras en 2007, podía percibir otros aspectos de su personalidad. Por ejemplo, era un carpintero entusiasta, altamente calificado, una indicación de la creatividad con buena percepción de detalle, un atributo que debe haber contribuido a las patentes concedidas a Bob. Fue un hombre de firmes convicciones que le hizo el delantero recto y quien proporcionó liderazgo positivo que le valió el respeto de sus inmediatos colaboradores y la comunidad científica. Estoy seguro que al final de su vida que llegó con un saldo positivo.

2:50

[56] **Adventures in fruit fly attractants – Multiple phases of Bob Heath's research to develop the food-based attractants for tropical tephritids.** Nancy D. Epsky. USDA-ARS-SHRS, 13601 Old Cutler Rd., Miami, FL 33158. Nancy.Epsky@ars.usda.gov

Research was initiated in 1991 to develop a dry trap with female-targeted synthetic attractant for tropical tephritids to replace glass McPhail traps and liquid protein baits that had been the standard for over thirty years. Both the male-produced pheromone and the liquid protein baits were to be evaluated as sources of attractant chemicals, and an overview of the planned approach was presented at the FL Ent Soc meeting that year. Results of this research have resulted in a dry trap, named Phase Four trap by the end users and in use currently in Guatemala and Mexico, a three component food-based synthetic lure, which is used worldwide for the Mediterranean fruit fly, and a two component lure for *Anastrepha* spp. fruit flies. This presentation summarizes the steps, categorized into phases as defined by Bob Heath, in the development of these ARS-patented products as well as the extension of this research into development of attract-and-kill bait stations for fruit fly control.

Investigación se inició en 1991 para desarrollar una trampa seca con atrayente sintético dirigidos a la hembra para tephritids tropical reemplazar el vidrio McPhail trampas y cebos de proteína líquida que habían sido la norma durante más de treinta años. La feromona producida por el macho y los cebos de proteína líquida debían evaluarse como fuentes de productos químicos atrayente, y una visión general del enfoque planificado fue presentada en la reunión de FL Ent Soc ese año. Resultados de esta investigación han dado lugar a una trampa seca, denominada fase cuatro capturas por los usuarios finales y en uso actualmente en Guatemala y México, un tres componente basada en alimentos sintéticos reclamo, que se utiliza en todo el mundo para la mosca del Mediterráneo, y un reclamo de dos componentes para moscas de la fruta Anastrepha spp.. Esta presentación resume los pasos, clasificados en fases definidas por Bob Heath, en el desarrollo de estos productos patentados de ARS, así como la extensión de esta investigación en el desarrollo de estaciones de cebo de atraer y matar para el control de la mosca de la fruta.

3:05

[57] **Bait formulations of attractants and phagostimulants for targeted, area-wide fruit fly control.** Bob Mangan. Subtropical Horticulture Research Station, 13601 Old Cutler Road, Miami FL 33158. Robert.mangan@ars.usda.gov.

Tephritid fruit flies attack hundreds of species of fruits and vegetables and are responsible for trade restrictions wherever they occur. Traps and “bait and kill stations” are important means of monitoring and control and Bob Heath made important contributions to these technologies.

Moscas de la fruta Tephritid atacar cientos de especies de frutas y verduras y son responsables de las restricciones comerciales dondequiera ocurran. Trampas "cebo y matar a las estaciones" es importantes medios de vigilancia y control y Bob Heath hizo contribuciones importantes a estas tecnologías.

3:20

[58] **Chemical ecology of the redbay ambrosia beetle (*Xyleborus glabratus*).** Paul E. Kendra, Wayne S. Montgomery, Jerome Niogret, Elena Q. Schnell, and Nancy D. Epsky. USDA-ARS-SHRS, 13601 Old Cutler Rd., Miami, FL 33158. paul.kendra@ars.usda.gov

The redbay ambrosia beetle, *Xyleborus glabratus*, is an exotic wood-boring pest first detected in the U.S. in 2002 near Savannah, Georgia. Females of *X. glabratus* vector a newly-described fungal pathogen (*Raffaelea lauricola*) that causes laurel wilt, a lethal disease of trees in the family Lauraceae. Laurel wilt has spread throughout the southeastern coastal plain, causing extensive mortality in native *Persea* species, including redbay (*P. borbonia*) and swampbay (*P. palustris*). Currently, it poses an imminent threat to commercial avocado (*P. americana*) in south Florida, and with continued westward spread, will threaten avocado production in Mexico and California as well. This presentation summarizes field and laboratory research focused on identification of the semiochemicals used by *X. glabratus* for host location. An understanding of host-based attractants will facilitate development of improved lures for early pest detection and control.

El escarabajo redbay ambrosia, *Xyleborus glabratus*, es una plaga de taladradores de maderas exó ticas que fue detectada por primera vez en los Estados Unidos en el 2002 cerca de Savannah, Georgia. Las hembras *X. glabratus* transmiten un recién descubierto pató geno fungico (*Raffaelea lauricola)* causante de marchitez de laurel, una enfermedad letal de arboles de la

familia Lauraceae. La marchitez de laurel se ha propagado por las costas llanas del sureste causando mortalidades extensivas de las especies nativas de *Persea*, incluyendo redbay ((*P. borbonia*) y swampbay (*P. palustris*). Actualmente, es una amenaza inminente para el aguacate commercial (*P. americana*) en el sur de la Florida y con su propagació n hacia el occidente, también será una amenaza para la producció n de aguacate en Mexico y California. Esta presentació n sumariza las investigaciones hechas en el campo y en el laboratorio enfocadas en la identificació n de semioquí micos usados por *X. glabratus* para encontrar a sus hospederos. Una comprensió n de los atrayentes de hospederos facilitará el desarollo de mejores cebos para la detecció n temprana y el control de esta plaga.

3:35

[59] **Wood and chemistry – or how to combine Bob Heath's two passions into entomology research.** Jerome Niogret**,** Paul E. Kendra, and Nancy D. Epsky. USDA-ARS-SHRS, 13601 Old Cutler Rd., Miami, FL 33158 Jerome.Niogret@ars.usda.gov

Plants generally produce complex mixtures of terpenoids that may differ greatly among species. Terpenoids, such C_{10} monoterpenes and C_{15} sesquiterpenes, are known to play an important role in the biology and ecology of plants, directly or indirectly influencing their interactions with their biotic environments. These plant chemicals are some of the primary cues used by insects to locate a preferred host tree or a specific location within a host tree. This presentation focuses on the study of volatile chemicals used as potential kairomones by males of the Mediterranean fruit fly and females of the redbay ambrosia beetle, using multidisciplinary approaches.

Generalmente, las plantas producen mezclas complejas de terpenoides que pueden diferir considerablemente entre las especies. Terpenoides, tal C10 monoterpenos y sesquiterpénicas C15, se sabe que desempeñan un papel importante en la biología y ecología de plantas, directa o indirectamente influir en sus interacciones con sus ambientes bióticos. Estos químicos de la planta se utilizan algunas de las señales primarias por insectos para localizar un árbol preferido de host o una ubicación específica dentro de un árbol de host. Esta presentación se centra en el estudio de sustancias químicas volátiles utilizada como potencial kairomones por los machos de la mosca del Mediterráneo y las hembras del escarabajo ambrosia redbay, utilizando enfoques multidisciplinarios.

3:50 - 4:10 Break - Gallery

4:10

[60] **Revealing the elusive sex pheromone of the renowned cactus moth, *Cactoblastis cactorum* (Lepidoptera: Pyralidae): A tribute to Robert Heath.** James E. Carpenter, Stephen D. Hight, and Juan Cibrian. USDA-ARS-CPMRU, Tifton. GA 3179 jim.carpenter@ars.usda.gov

The South American cactus moth, *Cactoblastis cactorum* (Berg.) (Lepidoptera: Pyralidae), became famous as a biocontrol agent during campaigns in Australia and South Africa to control exotic weedy *Opuntia* spp. During these campaigns, monitoring the impact and success of the cactus moth did not require the knowledge of its sex pheromone or mating behavior. But when the cactus moth arrived unintentionally in Florida and began expanding its geographical range along the Atlantic and Gulf coasts and threatening the native *Opuntia* biodiversity and *Opuntia*-based industries, identifying the sex pheromone of this now invasive pest became an urgent priority. Identifying sex pheromones of species within the family Pyralidae often can be difficult

and the cactus moth presented a special challenge because of the minute amount of pheromone produced by the female. But Robert Heath provided technical expertise and leadership to successfully identify the putative sex pheromone and the development of a pheromone lure for *C. cactorum*. The use of this pheromone lure has been crucial to identifying new outbreaks, and to developing control tactics. As a result, incursions in Mexico's Yucatan peninsula have been eradicated and geographical expansion along the United States Gulf coast has been mitigated.

La polilla del cactus de América del Sur, Cactoblastis cactorum (Berg). (Lepidoptera: Pyralidae), se hizo famoso como un agente de biocontrol durante las campañas en Australia y Sudáfrica para controlar exótico dragón Opuntia spp Durante estas campañas, supervisar el impacto y el éxito de la polilla del cactus no requería el conocimiento de su comportamiento de apareamiento o feromona de sexo. Pero cuando la polilla del cactus llegó involuntariamente en Florida y comenzó a ampliar su gama geográfica a lo largo de las costas del Atlántico y del Golfo y amenaza la biodiversidad de Opuntia nativa y las industrias basadas en Opuntia, identificación de la feromona sexual de esta plaga ahora invasiva se convirtió en una prioridad urgente. Identificación de las feromonas de sexo de especies dentro de la familia Pyralidae a menudo puede ser difícil y la polilla del cactus presenta un reto especial debido a la cantidad de minuto de feromona producida por la hembra. Pero Robert Heath proporcionan conocimientos técnicos y liderazgo para identificar correctamente la feromona putativos de sexo y el desarrollo de un señuelo de feromonas para C. cactorum. El uso de este señuelo de feromonas ha sido crucial para identificar nuevos brotes y tácticas de control en vías de desarrollo. Como resultado, las incursiones en la península de Yucatán de México han sido erradicadas y expansión geográfica a lo largo de la costa del Golfo de Estados Unidos ha sido mitigado.

4:25

[61] **Bob Heath's research contributions to floral attractants for Lepidoptera, or "Wow, I forgot I did that work!** Robert Meagher. USDA-ARS CMAVE, Gainesville, FL 32608. rob.meagher@ars.usda.gov.

Although most of Bob Heath's research involved tephritid fruit flies, in the early 1990s he conducted chemical identification studies of floral attractants for Lepidoptera. One report that documented the major chemicals released by night-blooming jessamine has been cited 88 times by authors in this field. The identification of these attractants helped entomologists design attract and kill systems for several looper pests of vegetables.

Aunque la mayoría de las investigaciones de Bob Heath tephritid moscas de la fruta, en la década de 1990 dirigió estudios de identificación química de atrayentes floral de lepidópteros. Un informe que documenta los principales productos químicos lanzados por jessamine florecen de noche ha sido citado 88 veces por autores en este campo. La identificación de estos atrayentes ayudó a diseñar de entomólogos atraer y matar a los sistemas de varias plagas looper de verduras.

4:40

[62] **I smell an invasive invader: using portable gas spectrometry at ports of entry**. Amy Roda, Scott Weihman, Jamal Al-Henaid, Paul Kendra, Wayne Montgomery, Elena Schnell, and Lisa Mosser. USDA, APHIS, PPQ, CPHST, 13601 Old Cutler Rd, Miami, FL 33158. amy.L.roda@aphis.usda.gov

Inspectors at ports of entry are faced with the daunting task of finding a visual sign of a pest or disease. Small insects, pests concealed inside plant material and plant diseases could escape detection and invade the country. In a collaborative effort, portable gas chromatography technology was tested to determine if volatile signatures could be used to detect fruit fly larvae concealed in grapefruit and to distinguish permissible bonsai trees species from prohibited citrus species. The applicability of the system was evaluated by inspectors at ports of entry.

Los Inspectores en los puertos de entrada se enfrentan a la difícil tarea de encontrar rastros visuales de una plaga o enfermedad. Pequeños insectos y plagas ocultas en material vegetal, así como enfermedades en las plantas, podrían escapar a la detección e invadir el país. En un esfuerzo mancomunado, se puso a prueba la técnica de cromatografía portátil en gases, para determinar si es posible utilizar rastros volátiles en la detección de larvas de mosca ocultas en toronjas.También para distinguir entre especies de bonsais permitidas y especies de cítricos prohibidas. Los inspectores en puertos de entrada evaluaron la aplicabilidad del sistema.

4:55

[63] **Hormonal regulation of sexual maturity and pheromone production in insects.** Peter Teal. USDA, ARS, CMAVE, 1600 sw 23rd Dr. Gainesville, Florida 32608. peter.teal@ars.usda.gov.

The Sterile Insect Technique (= SIT) is often used to control tephritid fruit fly pests. SIT benefits from efficient mass-rearing and requires released-male sexual competence. Juvenile hormone, and it analogs, can be used to accelerate sexual maturation and so increase fly production, and also to enhance the amounts pheromones released making sterile males more sexually competitive.

La técnica de insectos estériles (= SIT) a menudo se utiliza para controlar las plagas de mosca de la fruta de tephritid. SIT beneficia de cría de masa eficiente y requiere competencia sexual masculino lanzado. Hormona juvenil y análogos, puede utilizarse para acelerar la maduración sexual y así aumentar la producción de mosca, y también mejorar las feromonas cantidades lanzado haciendo estériles machos sexualmente más competitivo.

5:10 - 5:20 - Discussion - *End of Symposium*

Tuesday, 2:30 - 4:30 PM - Pompano room

Submitted Papers Session 1

2:30 Introduction

2:35

[64] **Field evaluation of Off! Clip-on Mosquito Repellent (Metofluthrin) against mosquitoes and ticks in Northeast Florida.** Rui-De Xue and Whitney Qualls. Anastasia Mosquito Control District, 500 Old Beach Road, St. Augustine, FL 32080. xueamcd@gmail.com

Metofluthrin has been used as active ingredient for spatial repellent through treated paper with a battery-operated fan device against adult mosquitoes. The repellent device has been tested against *Aedes albopictus* and *Ae. taeniorhynchus* (Diptera: Culicidae) and provided 70-80% protection from mosquito bites in the field. Also, the repellent device has been tested against the lone star tick, *Amblyomma americanum* (Acari: Ixodidae) in the State Park, conservation land, Northeast Florida, and the results showed that the Clip-on mosquito repellent device provided effective protection from tick infestation while the human volunteer sitting, but provided little protection from tick infestation while the volunteers walking.

2:47

[65] **When termites change the rules of epizootics.** Chouvenc Thomas and Nan-Yao Su. Department of Entomology and Nematology, Ft Lauderdale Research and Education Center, University of Florida, Institute of Food and Agricultural Sciences, 3205 College Avenue, FLREC. Davie 33314. tomchouv@ufl.edu.

Over the past 50 years, repeated attempts have been made to develop biological control technologies for use against economically important species of subterranean termites. Despite this effort, not a single successful implementation of classical biological control has been reported. Most of the work has been conducted under the assumption that environmental conditions inside the termite nest would favor the growth and the dispersion of entomopathogenic agents, resulting into an epizootic. Epizootics rely on the ability of pathogenic microorganism to self replicate and disperse among the host population. However, our study shows that, due to multilevel disease resistance mechanisms, the incidence of an epizootic within a group of termites is unlikely. The possibility for a fungal pathogen to complete its life cycle within the termite colony was mainly prevented by cannibalism and the burial behavior of the nest mates. Because subterranean termites, as a group, can prevent epizootics, the traditional concepts of epizootiology do not apply to these social insects, which explain why classical biological control has failed so far against termites.

2:59

[66] **Resource competition between two fungal parasites in subterranean termites.** Thomas Chouvenc, Caroline Efstathion, and Nan-Yao Su. 3205 College Avenue, FLREC. Davie 33314. cfefstathion@ufl.edu

Subterranean termites live in large groups in underground nests and the pathogenic pressure of the soil environment has led to the evolution of a complex interaction among individual and social immune mechanisms in the colonies. However, groups of termites under stress can show increased susceptibility to opportunistic parasites. In this study, an isolate of *Aspergillus nomius* was obtained from a collapsed termite laboratory colony and we determined that it was primarily a saprophyte and secondarily a facultative parasite if the termite immunity was previously stressed. This was determined by stressing individuals of the Formosan subterranean termite

Coptotermes formosanus in the form of a primary exposure to the virulent fungal parasite *Metarhizium anisopliae*. We also determined the dynamic of a mixed infection in a single termite host, where the virulent parasite *M. anisopliae* debilitated the termite immune system, but where the facultative but fast growing parasite *A. nomius* dominated the superimposed infection process. The resource utilization strategy of *A. nomius* during the superimposed infection resulted in successful conidia production, while the chance for *M. anisopliae* to complete its life cycle was reduced. Our results also suggest that the occurrence of opportunistic parasites such as *A. nomius* in collapsing termite laboratory colonies is the consequence of a previous stress, not the cause of the stress.

3:11

[67] **Fifty Years of innovation for structural fumigation with Sulfuryl Fluoride (Vikane® gas fumigant).** Ellen Thoms. Dow AgroSciences, 7257 NW 4th Blvd. #20, Gainesville, FL 32607. emthoms@dow.com.

Sulfuryl fluoride (SF), trademarked as Vikane® gas fumigant, was first commercially marketed in the United States in 1961. This presentation will review the continuous improvements made to safety-related equipment and procedures and novel applications of Vikane. Specifically, advances in equipment for monitoring and detecting sulfuryl fluoride, a recent dosage calculation tool for targeting the dose of the warning agent (chloropicrin), evolution of aeration procedures and the current stewardship program, and the diversity of structures and pests fumigated with Vikane will be discussed.

3:23

[68] **Semiochemical - based strategies for management of yellowmargined leaf beetle *Microtheca ochroloma* in crucifer vegetable production**. Rammohan Rao Balusu and Henry Fadamiro. Department of Entomology, 301 Funchess Hall, Auburn University, Auburn, AL-36849. balusrr@auburn.edu

The yellowmargined leaf beetle, *Microtheca ochroloma* Stål (Chrysomelidae) is the most damaging pest of organic crucifer production in Alabama and other parts of the southern United States. The goal of this study was to develop organically acceptable practices, particularly in semiochemical-based strategies for managing *M. ochroloma*. We studied mechanisms of host plant selection and preference among crucifer hosts in laboratory and greenhouse conditions. The results showed that turnip and napa cabbage are highly preferred hosts over cabbage and collards. Preliminary results of field trials with these preferred host plants as trap crops were highly encouraging in protecting the main crop. Semiochemical-based host plant odors in preferred host plants were further identified with GC-EAD and GC-MS techniques as a novel isothiocyanate.

3:35

[69] **Trap cropping for management of the yellow margined leaf beetle (*Microtheca ochroloma* Stål) in organic cruciferous crops.** Elena M. Rhodes, Oscar E. Liburd, Henry Fadamiro, and Rammohan Balusu. University of Florida Entomology and Nematology Department, Bldg. 970 Natural Area Dr., Gainesville, FL 32611. erhodes@ufl.edu.

Organic vegetable production is a growing industry in the United States. However, pest pressures have slowed the growth of this industry in southern states. The yellow margined leaf beetle

(YMLB), *Microtheca ochroloma* Stål, is a major pest of organic cruciferous crops. Turnip is a preferred host, so the purpose of this experiment was to determine if turnip is a viable trap crop for YMLB on organic farms. A 581 m^2 area on an organic farm near Starke, FL was divided into 6 treatment plots. Three plots had turnip planted in the outer rows as a trap crop while the other three plots had unplanted outer rows. Turnip plants were sprayed weekly with Entrust®. Two cash crops, mustard and napa cabbage, were planted in each plot. The number of YMLB on 10 randomly selected plants from each cash crop was recorded weekly. An injury assessment was conducted at harvest time. After the first 2 weeks, there were significantly less YMLB recorded from both mustard and napa cabbage in the trap crop plots. The average injury rating was also smaller in the trap crop plots. Therefore, using turnip as a trap crop appears to be a viable option for organic crucifer growers.

3:47 - 4:10 - Break - Gallery

4:10

[70] **Is *Xyleborus glabratus* the only ambrosia beetle spreading the pathogen causing the laurel wilt disease?** Daniel Carrillo, Jorge E. Peña, Rita Duncan & Randy Ploetz. University of Florida, Tropical Research and Education Center, Homestead FL., 18905 SW 280 ST, Homestead, FL, 33031. dancar@ufl.edu.

Multiple species of ambrosia beetles can coexist in tree trunks where their immature stages develop feeding upon symbiotic fungi. Ambrosia beetles are not considered primary pests and their symbiotic fungi are not considered pathogenic. An exception is the invasive species *Xyleborus glabratus* Eichhoff (Coleoptera: Curculionidae: Scolytinae) which carries a phytopathogenic fungus, *Raffaelea lauricola* T.C. Harr., that causes laurel wilt disease, lethal to several plants within the Lauraceae. This study explores possible interactions between *X. glabratus* and other ambrosia beetles that breed in Avocado and Swamp bay wood in areas invaded by *X. glabratus*. A series of experiments were designed to determine whether other ambrosia beetles species that emerged from *R. lauricola* infected wood can carry this pathogen and transmit it to healthy avocado and redbay plants. The pathogen was recovered from six species of ambrosia beetles (other than *X. glabratus*) that emerged from naturally infected swampbay trees. In addition, controlled infestations to avocado and redbay trees revealed that the six species of ambrosia beetles can transmit the pathogen to healthy redbay trees and cause wilting of the plants. Transmission of the pathogen was demonstrated in one instance by a single ambrosia beetle species. Possible implications if these findings are discussed.

4:22

[71] **Host plants of the sugarcane root weevil in Florida sugarcane.** Ronald H. Cherry, David G. Hall, and Dennis C. Odero. Everglades Research and Education Center, 3200 E. Palm Beach Road, Belle Glade, FL 33430. rcherry@ufl.edu

A greenhouse study was conducted to evaluate adult sugarcane root weevil (*Diaprepes abbreviatus*) residence (location), feeding damage, and oviposition choice on four sugarcane varieties and five weed species found in Florida sugarcane. Several weed species found in Florida sugarcane are suitable as food sources and oviposition sites for *D. abbreviatus*. However, sugarcane is generally more preferred for oviposition by *D. abbreviatus*. Preventing or removing

weed hosts of *D. abbreviatus* from sugarcane fields should be a front-line of defense against the weevil.

4:34

[72] **Ichneumonidae (Hymenoptera) from one *Quercus* forest in Tamaulipas, Mexico**. Enrique Ruiz-Cancino, Dmitri R. Kasparyan Juana MA. Coronado-Blanco and Andrey I. Khalaim. Facultad de Ingenieria y Ciencias, UAT, Centro Universitario, 87149 Cd. Victoria, Tam., México. eruiz@uat.edu.mx.

The Ichneumonidae collected from El Madroño, Victoria, Tamaulipas, Mexico, deposited in the Insects Museum (Universidad Autonoma de Tamaulipas) were determined. Eighteen subfamilies, 113 genera and 146 species are present. Subfamilies Cryptinae (32 genera, 47 species) and Ichneumoninae (22 genera, 23 species) were the most diverse. Seventeen species from this material were described during the last decade by UAT researchers.

4:46

[73] **Comparison of the study of braconids in northern and southern Tamaulipas, México.** J. M. Coronado-Blanco, E. Ruíz-Cancino and Andrey Khalaim. Facultad de Ingeniería y Ciencias, Universidad Autónoma de Tamaulipas, Centro Universitario Adolfo López Mateos 87149, Cd. Victoria, Tamaulipas, México. jmcoronado@uat.edu.mx.

Braconidae (Hymenoptera) is a family that includes parasitoids of Coleoptera, Diptera, Hemiptera and Lepidoptera, mainly. The State of Tamaulipas is located in northeastern Mexico. It has 43 municipalities, approximately 21 in the Nearctic region and 22 in the Neotropical region. All the 22 municipalities from southern Tamaulipas have been sampled and only 6 municipalities of northern region. In this State, 31 subfamilies, 139 genera, 72 determined species and 174 morphospecies have been recorded. The more studied subfamilies are Doryctinae with 17 genera, Alysiinae (14) and Microgastrinae (13). However, the subfamilies with more species recorded are Agathidinae (18) and Blacinae (10), Braconinae, Doryctinae, Opiinae and Rogadinae (6 each one). *Alabagrus*, *Blacus* and *Aleiodes* are the genera with more species. Microgastrinae is the subfamily more collected (in 23 municipalities), followed by Braconinae (22) and Doryctinae (19). In Tamaulipas, Neotropical region has been better studied, being important to do more collecting in the northern part of the State.

4:58

[74] **Differential response to climate change of two exotic weeds and their natural enemies: Implications for biological control in Florida**. Veronica Manrique, Rodrigo Diaz, and William A. Overholt. University of Florida, Indian River Research and Education Center (IRREC), 2199 South Rock Road, Fort Pierce, FL 34945. vero72@ufl.edu.

Global warming combined with rising atmospheric CO_2 levels could have drastic effects on the performance of invasive weeds and their insect herbivores. The objective of this study was to evaluate the effect of elevated temperatures and CO_2 levels on the performance of two invasive plant species and their biological control agents: 1) *Melaleuca quinquenervia / Oxyops vitiosa*, 2) *Alternanthera philoxeroides* / *Agasicles hygrophila*. A factorial experiment was conducted using two temperatures (28 and 32°C) and two levels of CO_2 (400 and 800 ppm) in environmental growth chambers. Seedlings of each plant species (10 plants per treatment) were exposed to each

of the four treatments for 21 days and several plant parameters were recorded weekly (e.g. plant height, number of stems). Then, ten first instars of *O. vitiosa* or *A. hygrophila* were caged with each plant and survival, developmental time, adult size and fecundity were recorded. *Melaleuca quinquenervia* plants growing under higher temperature and CO_2 (32°C and 800 ppm) were taller and had fewer stems than other treatments, while no differences were detected in plant growth of *A. philoxeroides* among treatments. Percent survival to adulthood, adult size and fecundity of *O. vitiosa* were similar among treatments. In contrast, high temperature at both CO_2 levels greatly reduced immature survival, adult size and fecundity of *A. hygrophila*. Thus, we predict that biological control of *A. philoxeroides* may be more severely disrupted by climate change than that of *M. quinquenervia*.

5:10

[75] **Implementing an integrated pest management program for coffee berry borer in a specialty coffee plantation in Colombia.** Luis F. Aristizábal, Olga Lara, & Steven P. Arthurs. University of Florida, Mid-Florida Research and Education Center. Apopka, Fl 32703. larist@ufl.edu.

Efforts to implement an integrated pest management (IPM) program for coffee berry borer *Hypothenemus hampei* (Ferrari) in “La Virginia” farm (110-ha coffee plantation) Colombia are discussed. Results over 3 yr showed widespread adoption of cultural, physical, and biological control methods. Overall, the IPM program was considered successful because problems associated with insect damage on the coffee crop decreased, despite reductions in endosulfan/chlorpyrifos use, which declined from 250 liters in 2002 to 75 liters in 2003, and 0 liters in 2004.

5:22 - Discussion

5:30 -*End of Submitted Papers Session 1*

Wednesday, July 25, 2012 -

8:00 - 10:30

Symposium: Howard Weem's - Sailfish room

Organized by - Bill Grogan FL State Collection of Arthropods , FL Dept. of Agriculture & Consumer Services, 1911 SW 34th St., Gainesville, FL 32614-7100. William.Grogan@freshfromflorida.com

8:00 - Introduction

8:05

[76] **Howard Weems's legacy and Diptera studies at the Florida State Collection of Arthropods.** Gary Steck. FL Dept. of Agriculture and Consumer Services, Division of Plant Protection, Gainesville, FL 32614-7100.

Dr. Howard V. Weems, Jr. was instrumental in developing the Florida State Collection of Arthropods from a small, regional insect collection to one of national prominence during his tenure from 1953 to 1991. He attracted a large following of museum Research Associates, including several leading North American dipterists who retired to Gainesville to continue their studies. Some of their contributions, as well as the presenter's recent discoveries in fruit fly larval taxonomy are described here.

8:25

[77] **Morphology of the larval stages of the weevil parasitoid *Lixadmontia franki.*** Teresa M. Cooper, Ronald D. Cave, and J. Howard Frank. Indian River Research and Education Center, University of Florida, 2199 South Rock Road, Ft. Pierce, FL 34945-3138. tmcooper@ufl.edu

Lixadmontia franki is a specialist parasitoid of bromeliad-eating weevils. The adult of this species was described by Wood and Cave in 2006. This paper describes the larval stages of *L. franki*. *Lixadmontia franki* has 3 instars that are easily distinguishable by the body size, shape and color, the amount and type of spinulae, and the size and shape of the mouth hook and the cephalopharyngeal skeleton. All 3 instars had posterior spiracles. Only the 3rd instar had anterior spiracles. Morphological variation between the instars can be explained by the different ecological needs of the instars.

8:45

[78] **The fascinating fly fauna of the Florida Keys (and a tip of the hat to Howard Weems, *diptériste extraordinaire.*** Lawrence J. Hribar. Florida Keys Mosquito Control District, 503-107th St., Marathon, FL 33050. lhribar@keysmosquito.org.

The Diptera of the Florida Keys are some of the most interesting components of the fauna, yet they appear not to be popular subjects for study. Both Nearctic and Neotropical species are present. Recent collections indicate the fauna may be richer than previously appreciated. The presentation will close with a few reminiscences of Howard Weems.

9:05-9:20 - Break - Gallery

9:20

[79] **Attracting and maintaining Tachinidae with flowering plants: Estimating attractiveness.** John Sivinski, Shoki Al Dobai, and Stuart Reitz. USDA-ARS, CMAVE, 1600 sw 23rd Dr., Gainesville, FL. john.sivinski@ars.usda.gov.

Flowering plants in agricultural landscapes can provide ecological services, such as nectar-food for adult parasitic flies such as Tachinidae. Of the 14 plant species tested only 4 captured significantly more Tachinidae than controls (*Agastache* hybrid, *Ageratina aromatic*, *Aloysia virgata*, and *Daucus carota*). At the subfamily level there were instances of significant captures of 3 of 4 subfamiles: Dexiinae, Exoristinae and Tachininae. "Attractive" plant species, those whose associated trap-catches were significantly greater than their controls, were not characterized by morphological characteristics (flower width, flower depth, flower density and

plant height), however the present study identified particular plants that could be incorporated into regional conservation biological control programs.

Plantas con flores en paisajes agrícolas pueden proporcionar servicios ecológicos, tales como néctar-alimentos para adultos parásitos vuela como Tachinidae. De las 14 especies de plantas probadas 4 único había capturado Tachinidae significativamente más que los controles (Agastache híbrido, Ageratina aromático Aloysia virgata y Daucus carota). En el plano de la subfamilia hubo casos de importantes capturas de 3 de 4 su: Dexiinae, Exoristinae y Tachininae. Especies vegetales "Atractiva", aquellos cuyas trampa-capturas asociadas fueron significativamente mayor que sus controles, no se caracterizaron por las características morfológicas (ancho de flor, profundidad de flor, altura de densidad y planta de flor), sin embargo el presente estudio identificó plantas particulares que podrían incorporarse en programas de control biológico de conservación regional.

9:40

[80] **Relationship of Florida's cattle and equine farms from a fly's perspective.** Phillip E Kaufman. Entomology and Nematology Department, PO Box 110620, University of Florida, Gainesville, FL 32611. pkaufman@ufl.edu

Stable flies are important pests of Florida's livestock industry. These opportunistic blood-feeding pests are also problematic on Florida beaches where they aggressively bite humans. Traditionally a confined livestock pest, stable flies increased in prominence on pastured animals in the early 1990's as producers switched to feeding large round bails, a known developmental site. Equine owners have long complained about the presence and control challenges associated with stable flies. To address this, research was undertaken to determine the breeding presence and adult hosts of flies captured on Florida equine facilities. To this end, a yearlong survey of adult and immature stable flies, their associated pupal parasitoids as well as a survey of summer blood-meal sources from captured flies was conducted. Results indicated that few stable flies and thus few parasitoids develop on equine farms and cattle were the most abundant blood-meal source. This study documented that stable flies were flying onto equine facilities within 16 hr of having taken a blood meal from cattle that were up to 2 km distant. The impact of this research suggests that with proper manure management, releases of beneficial parasitoids are an inefficient control strategy and that producers should focus on controlling immigrating adult flies.

10:00 - 10:30 - Discussion

End of Symposium

Wednesday, 8:00 - 10:30 - Pompano room

Submitted Papers Session 2

8:00 - Introduction

8:05

[81] **Factors influencing abundance and severity of *Bemisia tabaci* and tomato yellow leaf curl virus in West Central Florida tomatoes.** James E. Taylor and David J. Schuster**.** DuPont Crop Protection, 6922 Jamestown Manor Dr., Riverview FL 33578. james.e.taylor-1@dupont.com

Biotype B of the sweetpotato whitefly, *Bemisia tabaci* (Gennadius) (Hemiptera: Aleyrodidae), also known as the silverleaf whitefly, *B. argentifolii* Bellow and Perring has become the key insect pest of tomatoes, *Solanum lycopersicum* (L.), in southern Florida. In Florida, *B. tabaci* has become a limiting pest species in tomato due to its ability to vector *Tomato yellow leaf curl virus* (TYLCV) (family *Geminiviridae*, genus *Begomovirus*). The abundance of adult *B. tabaci* and incidence of TYLCV infection were estimated by twice weekly sampling of 24 to 273 ha commercial tomato farms in west-central Florida during four seasons from fall 2007 through spring 2009. Classification and regression tree (CART) analyses of the data indicated that certain environmental, geographical and cropping factor variables influenced populations of *B. tabaci* and the incidence of TYLCV infected plants. Environmental variables such as warmer temperatures were shown to increase adult *B. tabaci* counts. TYLCV incidence was not increased by increasing temperature but rather by the increasing season length. Geographical variables such as shorter buffer distances to non-tomato buffer areas on field edges and smaller contiguous tomato areas resulted in increased *B. tabaci* counts and incidence of TYLCV. Other factors such as rainfall, mulch type and tomato type did not have as much influence on populations as previously reported.

8:17

[82] **Methods and timing of applications to manage whiteflies and TYLCV with new insecticides in field grown tomatoes.** Barry Kostyk and Phil Stansly. UF- IFAS - SWFREC, 2685 State Rd 29 North, Immokalee Florida 34142. bkostyk@ufl.edu

The whitefly, *Bemisia tabaci* vectors many plant viruses among which tomato yellow leafcurl virus (TYLCV) is the worst in tomatoes worldwide and in Florida. Field trials conducted from 2011 and 2012 at the Southwest Florida Research and Education in Immokalee Fl. have shown that experimental products containing the active ingredients Cyantraniliprole and Flupyradifurone can effectively reduce both whitefly nymphs and adults on tomatoes. TYLCV incidence can be delayed when using these new products, but it has been important to get the active ingredient on/in the plant at an early stage of development. Drench applications at planting have consistently outperformed the corresponding drip and foliar application in suppressing whitefly populations and slowing the spread of TYLCV.

8:29

[83] **Asian citrus psyllid control strategies and phytoseiid mites abundance, diversity, and consequences for secondary pest populations.** Cesar Monzo and Philip A Stansly. SWFREC, 2685 State Road 29 North. Immokalee, Florida. cmonzo@ufl.edu.

Economic impact of HLB on Florida citrus industry has driven to the development of chemically oriented strategies aimed to control the vector of this disease. Most growers have greatly increased the frequency of sprays throughout the season. These practices may not be compatible with biological control agents such as predatory mites of the family phytoseiidae which are

especially sensitive to many insecticides exposure to which can result in population disruption and secondary pest resurgence such as rust mites or spider mites. In this study we evaluated how different intensities of insecticides used to control the Asian citrus psyllids (calendar sprays, sprays triggered by a nominal threshold of 0.2 and 0.7 psyllids per stem tap sample, and an untreated control) are affecting to the activity, density and biodiversity of phytoseiid and tetranychid mites. Abundance of phytoseiid mites was lower on trees receiving calendar sprays whereas no differences have been found between the two threshold strategies and the control treatment (no sprays). Additionally, higher citrus red mites numbers have been found associated to the calendar sprays strategy.

8:41

[84] **Effect of ACP control on citrus leafminer – Can both pests be managed simultaneously?** Moneen M. Jones and Philip A. Stansly. UF-SWFREC/IFAS, 2685 SR 29 N, Immokalee, FL 34142. mmjones2@ufl.edu.

The incidence of citrus canker has been increasing in Florida due in part to increased pressure from CLM. It is likely that broad-spectrum insecticides for ACP management, have impacted natural enemies of CLM and caused its rebound as a pest. On the other hand, some insecticides are effective against both pests. Here we document the effect of 3 ACP management scenarios (LV Oil, Insecticide x Nutritional, and Grower Standard (GS)) on CLM control. Leaf damage was assessed using a modified Horsfall-Barratt scale to determine if treatments were effective at reducing CLM numbers. Moth phenology was monitored weekly using pheromone traps. ACP populations were monitored using tap sampling and a spray threshold of 0.2 adults/stem tap sample. In the LV trial, CLM damage assessments found significant differences between the GS and oil treatments, with the GS having less CLM damage. In the Insecticide x Nutritional trial, significant differences between treatments were found with the nutritional-only plots showing most CLM damage and greater numbers of psyllids than insecticide-treated plots. Spraying directly after initial peak moth flight saw a >50% decrease in moth catch with damage assessments pending. We continue to monitor field populations for moth density and phenology.

8:53

[85] **Electroantennographic responses of the Asian citrus psyllid to various citrus volatiles.** Paul S. Robbins, Lukasz L. Stelinski and Stephen L. Lapointe. ARS, USDA, USHRL , 2001 South Rock Rd., Fort Pierce, FL 34945. paul.robbins@ars.usda.gov.

The Asian citrus psyllid, *Diaphorina citri* Kuwayama (Hemiptera: Psyllidae) constitutes a singular and daunting challenge to citrus worldwide because it transmits citrus greening disease, *Candidatus* Liberibacter asiaticus, also known as huanglongbing disease (HLB) for which there is no cure. Recent effort seeks to identify volatile compounds of insect or plant origin for monitoring and trapping. Small antennal responses were reported from electroantennogram (EAG) tests to (+)-limonene and grapefruit volatiles. Other than (+)-limonene, no compound capable of eliciting antennal response in *D. citri* has been identified. A multitude of volatile compounds is released by healthy citrus tissue and tissue disrupted by mechanical damage or exposure to chemical elicitors. The fate of these compounds in the atmosphere and the ecological role of breakdown products represent a poorly known aspect of plant-herbivore interactions. Degradation of host plant volatiles may result in production of foraging cues that are overlooked because they do not appear in the host plant itself. Here we report results of gas chromatograph-

coupled electroantennogram (GC-EAD) studies from *D. citri*, identification of active and inactive compounds from collections of citrus volatiles, and the serendipitous discovery of degradation products from common citrus volatiles that are active by EAG, GC-EAD and olfactometer assays.

9:05-9:20 Break

9:20

[86] **Female attraction to a pheromone produced by male Diaprepes root weevils.** Stephen L. Lapointe, Paul S. Robbins, Rocco T. Alessandro. USDA, ARS, U.S. Horticultural Research Laboratory 2001 South Rock Road, Fort Pierce, FL 34945. stephen.lapointe@ars.usda.gov

An unsaturated hydroxy ester pheromone collected from the headspace and feces of male *Diaprepes abbreviatus* has been isolated, identified and synthesized (1). The pheromone, methyl (*E*)-3-(2-hydroxyethyl)-4-methyl-2-pentenoate, was discovered by gas chromatography-coupled electroantennogram detection (GC-EAD) and identified by gas chromatography-mass spectrometry (GC-MS) and nuclear magnetic resonance spectroscopy (NMR). The activity of the synthetic *E* isomer was confirmed by GC-EAD, GC-MS, NMR and behavioral assays. In a two-choice olfactometer bioassay, female *D. abbreviatus* moved upwind towards the synthetic pheromone or a source of natural pheromone (male frass) more often compared with clean air. In olfactometer assays, males showed no clear preference for the synthetic pheromone alone. This compound, alone or in combination with plant volatiles, may play an important role in the location of males by female *D. abbreviatus*. A second putative pheromone has been identified from the frass of males and females and elicits antennal responses from both sexes. Ongoing effort focuses on description of behavioral response of males and females to single compounds and blends of pheromones and kairomones (2).
1. *Journal of Chemical Ecology* (2012) 38:408-417. DOI: 10.1007/s10886-012-0096-8
2. *Arthropod-Plant Interactions* (2009) 3:63-73

9:32

[87] **Winter and Spring application of SPLAT-CLM for control of citrus leafminer.** Craig P. Keathley, Lukasz L. Stelinski, and Stephen L. Lapointe**.** USDA-ARS-U.S. Horticultural Research Laboratory, 2001 South Rock Road, Fort Pierce, FL 34945-3030 craig.keathley@ars.usda.gov

Citrus leafminer, *Phyllocnistis citrella* Stainton, is active throughout the year in Florida and reproduces on periodic leaf flush in winter. We tested mating disruption in mature grapefruit trees during winter and spring using SPLAT-CLM, an emulsified wax with prolonged release of the insect's primary pheromone component, (*Z,Z,E*)-7,11,13-hexadecatrienal. SPLAT-CLM was applied in 2-ha blocks in winter and/or spring using a tractor-mounted machine that dispensed 1-g dollops into the tree canopy at a rate of 500 g/ha. Mating disruption was evaluated using pheromone-baited traps, and leaf mining was evaluated on new leaf flush. Based on disruption of male catch in pheromone traps and leaf infestation, the winter season treatment did not improve control in spring compared with a spring application alone. Moth flight preceded widespread leaf mining, suggesting that external sources may be important for colonizing some groves in spring.

9:44

[88] **Ultrastructural and behavioral studies on feeding and 'honeydew' excretion by nymphs and adults of the Asian citrus psyllid *Diaphorina citri* (Hemiptera, Psyllidae).** El-Desouky Ammar and David G. Hall, USDA-ARS, USHRL, 2001 S. Rock Rd., Fort Pierce, FL. 34945**.** eldammar@hotmail.com.

Nymphs and adults of the Asian citrus psyllid (ACP) transmit huanglongbing bacterium. ACP nymphs have shorter stylets and feed only on young leaves on smaller veins or on the sides of the midrib, whereas adults can feed on phloem anywhere on young or old leaves. Cross sections in citrus leaves indicated that the distance to the phloem is shorter from the sides of the midrib compared to that from the top, and is considerably shorter in younger than in older leaves. In ACP, the anal opening is on the ventral side in nymphs and on the dorsal side in males and females. Males produce clear sticky droplets gently laid on the leaf surface behind them, whereas the females powerfully release white pellets that travel away from the female. ACP nymphs produce long ribbons or tubes of white excretions that frequently stay attached to the exuviae after molting. Honeydew excretions of both nymphs and adult females are covered with a thin layer of wax-like material ultrastructurally composed of a convoluted network of thin filaments apparently produced by the wax glands below the anal ring which is absent in males. The significance of these differences in feeding and excretion behaviors is discussed.

9:56

[89] **Plant or diet interactions are not required for stylet sheath formation in phytophagous hemipterans from six species (Suborders: Auchenorrhyncha and Sternorrhyncha).** J. Kent Morgan, Robert G. Shatters, Jr, EricaRose A. Egan, Gary A. Luzio, El-Desouky Ammar, Wayne B. Hunter and David G. Hall. USDA-ARS, U.S. Horticultural Research Laboratory, 2001 South Rock Road, Fort Pierce, FL 34945**.** kent.morgan@ars.usda.gov

Phytophagous Hemiptera stylet sheath compositions are unknown, but have been suggested to form through interactions with external (plant tissue) molecules. We demonstrate stylet sheath formation and solidification without plant or diet interaction, using mock feeding chambers (membrane only, lacking diet) for *Diaphorina citri* (Psyllidae, Asian citrus psyllid), *Homalodisca vitripennis* (Cicadellidae, glassy wing sharpshooter/leafhopper), *Bemisia tabaci* biotype B (Aleyrodidae, whitefly), *Aphis nerii* (Aphididae, oleander/milkweed aphid), *Ferrisia virgata* (Pseudococcidae, striped mealybug), *Protopulvinaria pyriformis* (Coccidae, pyriform scale)]. Also, we present the use of Solvy, a dissolvable membrane, for the purpose of whole sheath isolation. Micrographs indicate a common sheath morphology having continuous hollow core structures of sequentially stacked hardened bulbous droplets. Single and multi-branched sheaths were common; however, mealybug and scale insects produced more multi-branched sheaths. SEM micrographs of the material secreted during the initiation of a new salivary sheath (the flange region) indicate that psyllids and aphids seal the sheath opening shut when they withdraw their stylets, while whitefly and leafhopper flanges remain open. For psyllids, sheath droplet hardening required approximately 45 seconds. These results advance the understanding of stylet sheath formation and the feeding process of these economically important hemipteran pests.

10:08

[90] **Weed biocontrol and food web subsidies.** Philip W. Tipping USDA-ARS, Invasive Plant Research Laboratory, 3225 College Ave, Davie, FL 33314. Philip.tipping@ars.usda.gov

Introducing weed biocontrol agents into communities can affect food webs as existing consumers respond to a new resource. The short and long term implications of these new interactions on community ecology are poorly understood and interpreting their influence remains subjective. Two insect biocontrol agents were introduced to control *Melaleuca quinquenervia* Cav. S. T. Blake in Florida wetlands in 1997 and 2001. The first, *Oxyops vitiosa* Pascoe (Coleoptera: Curculionidae), has larvae that are chemically defended by a secreted sticky covering of essential oils derived from the plant. The second species, *Boreioglycaspis melaleucae* Moore (Hemiptera: Psyllidae), has no obvious defenses. The defended *O. vitiosa* larvae were predated primarily by heteropterans, especially *Podisus mucronatus* (Say) (Hemiptera: Pentatomidae), while nymphs and adults of the undefended *B. melaleucae* were prey for spiders (10 species), coccinellids, neuropterans, syrphids, and heteropterans. Despite the presence of persistent and growing populations of *O. vitiosa*, there was no density dependent response by *P. mucronatus*, illustrating that even consistently high densities of biocontrol agents do not inevitably translate into resource opportunities for consumers which may result in unpredictable modifications to food webs.

10:20 - 10:30 - Discussion ***End of Submitted Paper Section 2***

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