FLORIDA ENTOMOLOGICAL SOCIETY
2008 ANNUAL MEETING ABSTRACTS

PIONEER LECTURE

The Florida Entomological Society pioneer lecture committee selected Freddie Johnson to honor Charlie and Madeline Mellinger of Glades Crop Care as pioneers in Florida entomology.

Dr. Freddie A. Johnson was born on August 5, 1938, in Tampa, Florida. According to Freddie, as a child, "bugs were his baby sitters." When his mother was busy, she would catch a bug and he would watch it for hours. He reminisces that "Bugs in jars saved her a million hours." Freddie graduated from Jennings High School near the Florida-Georgia border in 1957 and earned all three of his graduate degrees from the University of Florida: B.S. (1962), M.S. (1964) and Ph.D. (1975). While pursuing his graduate education, he served as a crop consultant and Extension entomologist, becoming an Assistant Professor in the UF Entomology and Nematology Department in 1975. He achieved tenure and promotion to Associate Professor in 1979 and became Professor & Coordinator of the Agriculture Information and Retrieval System (FAIRS) in 1984.

As an Extension entomologist, Dr. Johnson was responsible for obtaining, analyzing and preparing the most useful and practical information relating to insects, including their biology, behavior, management, control and associated information needed by clientele. This information was delivered through a variety of communication means, e.g., slide sets, tapes, radio, television, magazines, newsletters, computers, telephones, workshops, classes, clientele meetings, schools, and numerous forms of written publications. He worked with the Extension, teaching and research faculty and staff of the Entomology and Nematology Department as well as other UF/IFAS departments, research and education centers, agricultural leaders, farmers and growers, food and agriculture related industries, county Extension faculty and many segments of the general public to provide pest management information. He served as graduate advisor for seven M.S. and three Ph.D. students. As a highly successful and experienced Extension entomologist, Freddie strived to develop programs through gathering existing knowledge and conducting research and demonstration projects that advanced integrated pest management (IPM) in Florida.

Dr. Johnson served as Acting Chairman of the Entomology and Nematology Department in 1996 and, in 1997, became District III Extension Director for 13 counties in Central Florida. In this Extension position, he was responsible for (1) Staffing of county and multi-county positions, (2) Working closely with county Extension personnel concerning staff relationships, morale, salary matters, professional development, and performance evaluation, (3) Maintaining effective relationships between the Florida Cooperative Extension Service and the Board of County Commissioners, county officials, state officials, commodity organizations, industry representations, and consumer and natural resource groups, (4) Providing strong and positive leadership for the development and implementation of educational programs throughout the district, (5) Working closely with

other state and federal agencies within the district, and (6) Maintaining close working relationships with various IFAS Administrators, including Department Chairs, Center Directors, Director of Personnel Affairs, Grants office, SHARE office, and others.

Dr. Johnson has accomplished many notable achievements as a professional entomologist and received several special honors and awards. He copyrighted some of his Extension materials and published numerous book chapters, scientific journal articles, Extension circulars, pest management guides, and progress reports. He is frequently invited to make presentations at professional conferences and is well known for his expertise and candor. His method of instruction is to tell stories that portray important principles that he has learned during his years in the field of entomology. He significantly upgraded the Insect Management Guides (formerly known as the Florida Insect Control Guides) that were produced every year with few exceptions. Volumes I and II of the guides were approximately 600-700 pages in length and contained insect control and management information about all agronomic crops in Florida. The guides also listed all insecticides that could be legally used on each crop, along with their generic and trade names, application rates, pre-harvest interval times and other applicable warnings and instructions for correct use. IPM, scouting, economic thresholds and other information was contained in these guides. Due to the extreme insect pressure that exists under Florida's environment, there are always insects that create tremendous and extraordinary control problems, e.g., sweetpotato whitefly, vegetable leafminer, armyworms, western flower thrips, *thrips palmi*, diamondback moth caterpillar, pepper weevil, mites and a host of others.

During the past 10-15 years, Dr. Johnson has helped to solve an array of pest management problems exacerbated by a lack of legally available insecticides. He worked with the Florida Department of Agriculture and Consumer Services, in conjunction with the EPA, to justify special local needs (24c) and Section 18 emergency registrations for insecticides needed to protect some of Florida's most valuable crops. Throughout his career, he provided the needed research information for these programs. His educational activities are closely linked to these accomplishments, especially in the area of IPM. Education and training are required for clientele to adopt IPM practices, but Dr. Johnson's success is evident in increased crop scouting and accurate identification of pest species. He has helped growers "move away from the days of old when windshield inspections of a crop was enough to trigger a spray application." Growers are now more aware of the value of beneficial arthropods and other forms of natural controls. Spraying insecticides by the calendar is no longer acceptable. Freddie retired from UF/IFAS Extension in 2007, leaving a strong IPM presence in Florida.

CHARLES AND MADELINE MELLINGER
GLADES CROP CARE, INC.

Madeline Mellinger is founder & CEO of Glades Crop Care, Inc., the largest agricultural consulting firm in the southeastern US, headquartered in Jupiter , FL. Her husband, Charles, is Director of Technical Services. Glades Crop Care received the First National IPM Award in 2006 and was selected to receive the Southern Region IPM Center's Friends of IPM Award in 2008. Madeline and Charles will be awarded the Florida Entomology Society's Pioneer Award in July, 2008.

Madeline grew up in Blacksburg, Virginia, where her father was a professor of chemistry at Virginia Polytechnic University (now Virginia Tech). Her entomology experience began when she worked with Mary Ross doing cockroach dissections and staining for slides in genetic research. Her promise was evident early when she won the Junior Science Award the same year that her father won the Senior Science Award at the Virginia Academy of Sciences. Most of her college coursework was at Virginia Polytechnic in biology and at the University of Georgia in entomology. She spent a summer at the University of Virginia's Mountain Lake biology station. She describes the place as 'Spartan' and they had to bring in a television for the occasion of the moon landing. She graduated cum laude at the University of Louisiana in Monroe.

Charlie grew up in Lancaster, PA. He preferred working on his grandfather's 10 acre truck farm to his father's lumber and building supply business. They grew an acre of staked tomatoes where he learned early to rogue the TMV-infected plants to prevent mechanical transmission. He earned his PhD in Botany and Plant Pathology from Michigan State University. Charlie moved to Florida where he became Corporate Plant Health Director at Yoder Brothers and then, in 1980, Director of Glades Crop Care, which Madeline had founded in 1972.

Charlie oversees the company's field consulting work that serves over 60,000 acres and over 60 fresh market high value specialty crops. Three main services are provided:

- Advanced crop scouting and pest and beneficial insect population analyses resulting in grower recommendations.
- Food safety programs for fresh market crops and packing facilities -- both educational and auditing.
- Efficacy and residue new product research, IPM alternatives and area wide biological and ecological research for sustainable solutions.

Charlie has served in numerous capacities for the National Alliance of Independent Consultants, including Treasurer and Board of Directors. He has held a number of committee and board positions with the American Phytopathological Society, a member of the EPA/USDA National Tolerance Reassessment Advisory Committee, Protected Harvest Board. Additionally he has served as Chair of its Research Committee and of several University of FL Advisory and Search Committees.

Awards recognizing Charlie's contributions include:

- "Certificate of Appreciation from USDA in recognition of the first western hemisphere find of *Thrips palmi*;
- Four Pesticide Environmental Stewardship Program Champion Awards from EPA for outstanding risk reduction from the use of pesticides;
- Two FL Horticultural Society Presidents Award for Industry; American Cyanamid "Consultant of the Year";
- The first IPM Achievement Award from the National IPM Symposium in 2007; and
- The Southern Region IPM Center's Friend of IPM Award in 2008.

Madeline has served as an advisor to the U.S. Congress, National Academy of Sciences, the Environmental Protection Agency, the federal and state Extension Service and various universities. Beginning in 1992 she was appointed by three successive U.S. Secretaries of Agriculture to the National Sustainable Agriculture Advisory Council which reports directly to the U.S. Secretary of Agriculture. She was elected chairman for two years. Her services to Florida, U of FL and the Land-Grant System include:

- National Council for Agriculture Research, Extension, and Teaching (CARET) of the National Association of State Universities and Land-Grand Colleges
- CARET liaison to the Extension Committee on Policy
- FL Ag Council Chair
- UF School of Natural Resources and the Environment Advisory Board
- UF/IFAS Everglades Research and Education Center Advisory Board
- UF/IFAS Advisory Board for Assistant VP for Marketing and Communications
- FL Delegate to the National Leadership Seminar
- UF/IFAS Strategic Planning Committee Co-Chair
- UF/IFAS Statewide Stakeholder and Faculty meeting Co-Chair
- UF/IFAS Vice Presidential Search Committee
- Iowa State University, Kansas State University and University of California Agricultural Marketing Resource Center Board of Directors
- UF/IFAS Doctor of Plant Medicine's First External Advisory Group Chair

Madeline's services to her Consulting Profession include:

- American Society of Ag Consultants Board of Directors
- National Alliance of Independent Crop Consultants President
- Foundation of Environmental & Agricultural Education Founding Member & President

Awards Received by Madeline include:

- USDA CSREES: First Hall of Fame
- Farm Foundation's Bennett Agricultural Round Table Chair
- Florida Extension Service: Outstanding Volunteer
- Florida Extension Service: Service to Agriculture

M. S. STUDENTS

Chan, Wai-Han, P. Koehler & R. Pereira. **Wood moisture effects on termite mortality and weight loss.**

Subterranean termites infest wood at different levels of moisture. This experiment looked at the mortality rate and water weight loss in *Coptotermes formosanus* at different percentages of moisture. Using pieces of wood at seven different levels of moisture with no soil contact, we have found that termite mortality and weight loss is high until it reaches a threshold of 24-30% moisture content. This shows that termites need levels above 24% in order for long term survival

Ferreira, M. T. & R. Scheffrahn. **Dispersal behavior of the West Indian drywood termite *Cryptotermes brevis* (Walker).**

The West Indian drywood termite *Cryptotermes brevis* (Walker) goes through a dispersal flight in its life cycle. Light attraction was determined by exposing the alates to a choice between lighted and dark wood pieces to colonize. Also several intensities of light were provided in order to determine if light intensity has a role in the choice of a colonizing spot. Time spent crawling in search of a colonizing spot was also analyzed.

Pfiester, M. & P. Koehler. **Ability of bed bug detecting canines to locate live common bed bugs and viable bed bug eggs (*Cimex lectularius*)**

Common bed bugs, *Cimex lectularius* L., are difficult to visually locate. The efficiency of detector dogs, which use olfaction rather than vision, was tested by placing live bed bugs and viable bed bug eggs in vented PVC containers. Dogs had an overall accuracy of 97% in locating live bed bugs and eggs. Detector dogs can be used effectively to locate live bed bugs and viable bed bug eggs.

Scott, C. A. & O. E. Liburd. **Evaluation of techniques for monitoring aphids (Hemiptera:Aphididae) and whiteflies (Hemiptera:Aleyrodidae) in organically grown summer squash**

We compared several different sampling techniques to monitor aphids and whiteflies in organic squash. *In situ* counts, unbaited yellow sticky traps and blue pan traps were compared for monitoring alate aphids, while *in situ* counts and unbaited yellow sticky traps were used for whiteflies. Significantly higher aphids and whiteflies were observed with *in situ* counts in 2006 and 2007. Potential benefits of *in situ* counts are discussed for improving timely management strategies of key pests.

Ph. D. STUDENTS

Bujang, N. S. & Nan-Yao Su. **Sublethal effects of radiation on two termite species and their gut microfauna.**

We report and compare the sublethal effects of UV exposure on the gut microfauna of *Coptotermes formosanus* Shiraki and *Reticulitermes flavipes* (Kollar). After radiation under various UV wavelengths and exposure times, a no-choice feeding test was carried out. The number and weight of surviving termites, the abundance of protozoans and the termite's feeding activity were recorded on prearranged days. The

relationship between the effects of UV exposure on the gut and microfauna and termite will be discussed.

Chouvenc, T. & Nan-Yao Su. **Antifungal activity of the termite alkaloid norharmane against the mycelial growth of *Metarhizium anisopliae* and *Aspergillus nomius***

Antifungal activity of norharmane, a β-carboline alkaloid found in termites (Isoptera) was tested against two entomopathogenic fungi, *Metarhizium anisopliae* and *Aspergillus nomius*. It was determined that, at physiological concentration (10 $\mu g.ml^{-1}$), norharmane had no significant effect on *A.nomius* mycelial growth rate but reduced *M.anisopliae* growth rate by 11.9%. Contrary to previous findings, we suggest that norharmane has a limited role in disease resistance in individual termites, but may have a potential role at colony level.

Cooper, T. **Post-release monitoring of a biological control agent, *Lixadmontia franki*, in Florida**

A potential biological control agent, *Lixadmontia franki*, was released in Florida to control an invasive bromeliad-eating weevil, *Metamasius callizona*. Adult flies were released in 4 natural areas, beginning in June 2007. Sentinel plants inoculated with the weevil were placed in the field 5 weeks after the releases, coinciding with the time for the F2 fly generation to be reproductively active. Two flies have been recovered.

Diclaro, J. W. II. **Fly traps and toxicant treated cord for control of house flies.**

Baited fly traps are commonly used to catch flies. To improve performance, wool cord dipped in 2.5% imidacloprid spray bait was looped around the trap. Flies (~300) were released into cages; mortality counts were recorded. Within 48 h, fly traps with attractant but no cord killed ~27%; traps with attractant and treated cord killed ~98%; and treated cord loop alone killed ~94%. Treated cords could enhance the performance of fly traps or be used alone for fly control.

Gill, H. K, R. McSorley, R. Krueger, G. Goyal & D. D. Treadwell. **Do organic mulches have impact on the soil surface insect community?**

Mulching by spreading organic matter around plants can control the attack of insect pests and weeds. A field experiment was conducted to determine the impact of different kinds of mulches (pine bark, residues of sunnhemp, sorghum-sudangrass, and cowpea) on the soil surface insect community. Pitfall traps were used for sampling insects. Other parameters observed were weed and nematode counts, and plant stand. Results will be presented on effect of different mulches on insects and other measured parameters.

Goyal, G., G. S. Nuessly & H. K. Gill. **Spatial and temporal distributions of corn-infesting picture-winged flies**

Distributions of four Dipteran pests in the family Ulidiidae (*Euxesta* and *Chaetopsis* spp.) were studied in commercial and experimental sweet corn fields in Belle Glade during spring 2008. Adults were sampled using yellow sticky traps from silking through harvest. Distributions were studied in relation to insecticide applications and

plant growth. Species distribution of adults will be presented in relation to larvae-infested ears.

HansPetersen, H. N., R. McSorley, O. E. Liburd, H. K. Gill, N. Om, R. Krueger & J. Pack. **The influence of four hedgerows on arthopod population dynamics in adjacent vegetable crops.**

Hedgerow treatments (sorghum-sudangrass, pigeonpea, weeds or bare ground) were intercropped with squash to determine their influence on arthropod population dynamics. Traps were placed within the hedgerow and squash crop. Predatory arthropod population density was highest in the squash crop bordered by sorghum-sudangrass and pigeonpea and lowest in the squash bordered by bare ground and weeds. Intercropping hedgerows within the agricultural landscape may influence the dispersal and establishment of predator species in adjacent crops.

Li, Hou-Feng, R. H. Scheffrahn, Nan-Yao Su, N. Kanzaki & Rou-Ling Yang. **Taxonomic status of *Reticulitermes* sp. of Lanyu island, Taiwan.**

Lanyu Island is the type locality of *Reticulitermes flaviceps* (Oshima) that was collected and described in 1912. However, Tu (1955) and Morimoto (1968) suggested that *R. flaviceps* at Lanyu is morphologically close to *R. fukienensis* Light or *R. speratus* (Kolbe). In this study, analysis of nucleotide sequences of three mitochondrial genes, COII, 12S, and 16S confirmed that the *R. flaviceps* is a valid species and it is found at both Lanyu Island and Taiwan Island.

Rhodes, E. M. & O. E. Liburd. **The effect of southern highbush blueberry variety on thrips numbers and fruit injury in Florida**

Flower thrips are key pests of Florida blueberries. Field experiments were conducted to determine whether thrips numbers and fruit injury differed among four southern highbush blueberry varieties. In both 2007 and 2008, Emerald and Jewel had higher numbers of thrips per trap and thrips larvae per flower than millennia and star (2007 only). In 2007, Emerald and Jewel sustained more fruit injury than millennia and star. There were no differences in fruit injury in 2008.

Sandhu, H. & G. Nuessly. **Development rates and thresholds for lesser cornstalk borer on sugarcane at constant temperatures.**

Lesser cornstalk borer (*Elasmopalpus lignosellus*)(Zeller) (Lepidoptera: Pyralidae) was reared at 12 constant temperatures to determine development rate and thresholds on sugarcane plants. Egg, larval, and pupal stage duration decreased linearly with increase in temperature from 16°C to 30°C, but increased with further increase in temperature. Pre-oviposition and post-oviposition period decreased, while oviposition period increased with increase in temperature from 16°C to 27°C. Upper and lower developmental thresholds for all stages will be reported.

Sims, K., J. Funderburk, J. Becnel & D. Boucias. **Pathogenicity of *Thripinema fuscum* Tipping & Nguyen (Tylenchida: Allantonematidae) infecting *Frankliniella fusca* (Hinds) (Thysanoptera: Thripidae).**

The insect parasitic nematode *Thripinema fuscum* is a key regulator of *Frankliniella fusca* in agricultural peanut across the southeastern US. The potential of *T. fuscum* to act as a biological control agent of *F. fusca* has been recognized; however, very few studies have investigated the pathological changes induced by the entomogenous parasite. A combination of light and electron microscopy were used to determine how the parasitic *T. fuscum* modulates the physiology of its thrips host.

Taylor, J. & D. Schuster. **An analysis of the spatial distribution of silverleaf whitefly and *Tomato Yellow Leaf Curl Virus* (TYLCV) in tomato using geographical information systems.**

The silverleaf whitefly, *Bemisia argentifolii* (also known as biotype B of the sweetpotato whitefly, *B. tabaci*), is the key insect pest of tomato in southern Florida. Most damage associated with the whitefly is due to the transmission of plant viruses, the most damaging of which is *Tomato yellow leaf curl virus* (TYLCV). Reported is an evaluation of the capabilities of geographic information systems (GIS) and global positioning systems (GPS) to map adult whitefly density and TYLCV incidence. Also included, is an analysis of the distribution of silverleaf whitefly and associated TYLCV in tomato.

Vazquez, R. & P. Koehler. **Trail establishment to different food sources in *Paratrechina pubens* and *Pheidole megacephala.***

In Florida, we have two very invasive tramp ant species emerging as a problem, the African big-headed ant, *Pheidole megacephala*, and the Caribbean crazy ant, *Paratrechina pubens*. There is very little known about the biology of both of these ant species and how foraging behavior influence their development into super colonies. We hypothesize that food needs vary for single and multiple queen colonies of the African big-headed ant and Caribbean crazy ant

Vitullo, J., C. Bergh, A. Zhang & C. Mannion. **Susceptibility of different *Hibiscus rosa-sinensis* cultivars to feeding symptoms of pink hibiscus mealybug (Hemiptera: Pseudococcidae).**

Pink hibiscus mealybug has poorly understood feeding symptoms. Under different initial densities, 'President' exhibited no difference in latency to symptoms; but a linear relationship between density and symptom severity. Latency to symptoms for 'Double Red' and 'Snow queen' took longer and severity of symptoms was less than 'Florida Sunset' and 'Joanne', which were comparable to 'President', though reproduction occurs on all. Symptoms are not generic to all hosts and do not correlate with mealybug populations.

POSTERS

Haseeb, M., C. W.O'Brien & M. T. K. Kairo. **Identification tool for the potentially invasive weevil species from the Caribbean countries to the United States.**

One vital process in pest prevention strategies is the immediate and accurate identification of potential pest(s) before these spread and impact our agriculture and natural resources. Taxonomists have the primary support role for identifying and/or verifying the identification of potential pest(s). We have developed an identification tool

for the potentially invasive weevil species (41 species & 26 genera) from the Caribbean Countries to the United States. The tool will be available later this year online.

Jenkins, D. A. & R. Goenaga. **Placement of cone emergence cages and its impact on monitoring of *Phyllophaga vandinei* (Coleoptera: Scarabaeidae).**

Cone emergence cages placed in and around an orchard of *Pouteria sapota* reveal facts that have implications for monitoring of *Phyllophaga vandinei*:

1. Traps continued to catch emerging adults three years after placement
2. Traps west of the tree caught more adults than traps placed east of the tree, between trees, or adjacent to the orchard
3. Beetles caught in the traps include adults that have oriented to the trap at dawn and burrowed under it

Kendra, P. E., A. L. Roda, W. S. Montgomery, E. Q. Schnell, A. Vázquez, S. W. Weihman, R. Halitschke, N. D. Epsky & R. R. Heath. **Signature chemicals for detection of hidden insect infestation.**

Tephritid fruit flies are major pests worldwide, but infestation is difficult to detect since the larval stages are concealed within host fruits. Using grapefruit infested with the Caribbean fruit fly, we evaluated gas chromatography (GC) as a tool for detection of hidden infestation. We found several GC peaks potentially diagnostic for larval-infested citrus. If infested commodities consistently release unique chemical profiles, this "signature" may provide the basis for rapid, sensitive screening protocols.

Kendra, P. E., J.S. Sanchez, W.S. Montgomery & N. D. Epsky. **Ovary development in two genetic strains of the Caribbean fruit fly (Diptera: Tephritidae).**

Olfactory reception and behavioral response to semiochemicals are influenced by an insect's physiological state, including sexual maturity. For tephritid fruit flies, reliable methods are needed for assessing maturity status of field-caught adults. Previously, we developed a six-stage system to classify ovary maturation in a laboratory strain of the Caribbean fruit fly, *Anastrepha suspensa*. In this study, we evaluated a wild strain of *A. suspensa* to document differences in female maturation between the two genetic strains.

Kim, Seong-Ryul, Kwan-Ho Park, Iksoo Kim & Jae-sam Hwang. **Analysis of immune-inducible transcriptome from the swallowtail butterfly, *Papilio xuthus*, using PCR-based GeneFishing system.**

We have isolated several immune-inducible genes that are specifically expressed by employing annealing control primer (ACP)-based PCR from the larvae of swallowtail butterfly, *Papilio xuthus*. Sequence analysis showed that 18 differentially expressed genes revelaed a high sequence similarity to the previously characterized genes of other insects. Among these inducible transcripts we found 8 putative immune-related genes including cecropin and attacin. Finally, we analysed the expression profiles of potential immune-related genes by RT-PCR and found all of them were considerably increased in the mRNA levels by LPS injection.

Leibee, G. L., L. S. Osborne, M. L. Kok-Yokomi, C. L. McKenzie & R.Shatters, Jr. **Toxicity of selected insecticides to a strain of *Bemisia tabaci* Type Q from Florida.**

A collection of Bemisia tabaci from Hibiscus in Florida in 2006 from a retail outlet was determined to be Type Q. A laboratory culture from this collection treated with imidacloprid plus cyfluthrin showed about 8000-fold resistance to imidacloprid compared to a reference strain of B. tabaci Type B. The toxicity of dinotefuran, cyfluthrin, and pyridaben to these strains was also compared.

Mizuri, M. Hert, W. B. Hunter & D. G. Hall. **Detection and characterization of a novel reovirus in the Asian citrus psyllid, *Diaphorina citri* (Hemiptera: Psyllidae)**

Previously, an insect-infecting reovirus was discovered in adult psyllids. We examined infection rates within psyllid populations and viral pathogenicity on an insect cell culture. Here we identified 20% of green house psyllids and 55% of field psyllids were infected with this virus. The psyllid reovirus was shown to negatively affect insect cell line, SF9, viability. These data suggest this new reovirus has potential as a biological control for psyllid populations.

Mizuri M.H., W. B. Hunter & D.G. Hall. **Asian citrus psyllid, genetic basis of immunity.**

To understand the genetic basis of how the Asian Citrus Psyllid responds under chemical and environmental stresses, we treated psyllids with admire (imidacloprid) or heat shock. A homologue of Cyp450 was induced by admire treatment. A homologue of heat shock protein Hsp70 was found to be induced by heat shock. These insights provide genetic targets to effectively reduce psyllids by insecticides and hot summer temperatures.

Roubos, C. R. & O. E. Liburd. **Predicting blueberry gall midge activity using emergence traps and a temperature-development Model.**

Blueberry gall midge, *Dasineura oxycoccana* (Johnson), adults were reared from third instar larvae in the laboratory at six constant temperatures. An approximate temperature threshold and degree-day requirement for the pupal stadium was calculated. The degree-day estimate was compared with emergence trap data. Maximum adult emergence occurred at 20 and 25°C. Based on first trap captures in January 2008, it was estimated that blueberry gall midge began pupation as early as mid-December.

Sanders, W. R., O. E. Liburd & L. L. Stelinski. **Differential response of grape root borer (Lepidoptera: Sesiidae) to its own synthetic sex pheromone and an off blend containing its major component.**

Two different blends of sex pheromone were tested for differential response in Grape root borer (GRB) males. In field observational studies, the total number of visits, duration of each visit, and males' physical contact with the pheromone lure were recorded. In field trapping studies, synthetic GRB pheromone was compared with two dosages of an off blend pheromone for effectiveness as a monitoring bait. Overall, the GRB pheromone was more attractive to males compared with other lures tested.

Seal, D. R., W. Klassen, C. M. Sabines, G. Kakkar & V. K. Jha **Present status of Melon thrips, *Thrips palmi* Karny and Western flower thrips, *Frankliniella occidentalis* (Pergande), Thripidae, Thysanoptera in various vegetable plantings.**

The chilli thrips, *Scirtothrips dorsalis* Hood is a newly introduced pest of fruits, ornamentals and vegetables. In the present study, we investigated effectiveness of Neonicotinoid insecticides and two entomopathogenic fungii, various formulations and method of applications, for managing chilli thrips. Immidacloprid provided significant reduction of S. dorsalis when applied both as a soil drench and as a foliar application. Beauveria bassiana and Metarhizium anisopliae also reduced chilli thrips, but the performance was inconsistent.

Wayne B. Hunter, R. Shatters, Jr. & D. G. Hall. **FK506-binding protein from adult Asian citrus psyllid, *Diaphorina citri* (Hemiptera: Psyllidae).**

Mining available genomic information from Asian citrus psyllid, *Diaphorina citri*, (Hunter et al) identified FK-binding proteins (FKBP) which function in many critical pathways needed for psyllid survival. The transcript from the gene FK506BP in D. citri was also isolated and sequenced from whole body tissues. A high degree of similarity among FKBP's across many different taxonomic groups including insects is known. The importance of FK506BP functions lend it to be a genetic target to reduce *D. citri* populations.

Wayne H., S. Dowd, C. McKenzie, R. Shatters, Jr. & D. Hall. **Expressed genes in Asian Citrus Psyllid adults feeding on citrus.**

A genomics approach was used to identify the genetic basis of psyllid biology, *Diaphorina citri*, identifying in particular genes associated with feeding, reproduction, and insecticide resistance. Use of a full genomics approach will rapidly advanced understanding of psyllid biology and its endosymbionts. The development of genetic products sets the foundation for further functional genomic studies needed for the development of emerging management strategies aimed at reducing psyllids and the spread of Huanglongbing.

INDUSTRY SYMPOSIUM

Eger, J. E. Jr., M. T. Messenger, S. Buckley, L. Remmen, A. L. Szalanski & J. A. McKern. **Sashimi: A component of the isopteran palate?**

In June of 2005, the first and second authors spent two weeks in the Kaw Mountains of French Guiana on an insect collecting trip. During this time, we observed subterranean termites (*Nasutitermes* sp.) (Isoptera: Termitidae) feeding on fish heads that were secured to the ground to attract other insects. These observations of Neotropical termites feeding on fish suggested that there might be some component of fish carrion that would improve the attractiveness of termite monitoring devices to *Reticulitermes* spp. (Isoptera: Rhinotermitidae). To evaluate this potential attractant, we initiated field trials in Florida, Delaware and France in which small bait fish were added to Sentricon® stations equipped with wood monitors.

Hickman, B. **Fipronil transfer mechanisms among social insects.**

Horizontal transfer of fipronil among social insects may occur during a variety of social interactions including simple contact, allogrooming, trophallaxis, necrophagy, cannibalism and necrophoresis. The degree of transfer with any particular mechanism will vary depending on many factors affecting fipronil donor and recipient insects. Results from three research trials give insight into some of these factors affecting fipronil transfer.

Jordan, K. K. **The new and the old: combining technologies for more pest control options.**

An ever-expanding line of effective 'environmentally-friendly' products parallels the industry's increasing attention to 'green' pest control. Naturally, this includes creating new technology, but is also involves improving current technology. This presentation will highlight new micro-cap technology and will review a series of actives in the context of sensitive and 'environmentally-conscious' pest management programs.

Ryser B.W. **The use of advanced electronic equipment to detect Subterranean termites in the field.**

Inspections for the presence of subterranean termites is problematic due to their cryptic nature. Infestations are often undetected and represent the most cited industry violation by Florida DACS. A pest control industry estimate is most operators overlook as much as 70% due to hidden areas behind walls and foundations. This paper reports numerous alternative advanced detection equipment used in the field to overcome hidden areas to detect the presence of subterranean termites in the field.

Thoms, E. **Vikane® gas fumigant - An effective treatment for eliminating infestations of bed bugs, *Cimex lectularius.***

The common bed bug, *Cimex lectularius*, rarely found in the US during the last 50 years, has made a resurgence as a pest of homes, apartments, hotels, dormitories, and long-term health care facilities. According to the National Pest Management Association, bed bug complaints in the US have increased 50-fold over the last five years. The bed bug feeds on humans and other warm-blooded animals, leaving inflamed, itchy welts that can require days to heal.

The current challenges of eradicating bed bugs in buildings are well documented. Treatments require intensive inspections, extensive sanitation, repeated applications of residual insecticides and steam or heat treatments, and often discarding of infested mattresses and upholstered furnishings. Vikane® gas fumigant can reliably eradicate bed bug infestations with one, stand-alone treatment at 3-fold the drywood termite dosage rate. The presentation will review methods for fumigating a variety of structures, including buildings, vehicles, and cargo containers, for elimination of bed bugs infesting all types of building contents and furnishings.

Wyatt-Evens, C., D. Branscome & M. Zajac. **Optigard® Cockroach bait: Secondary kill via coprophagy in the German cockroach**

1st instar German cockroaches *(Blattella germanic*) are relatively sedentary and rely on coprophagy, the ingestion of feces, to satisfy their dietary needs. This behavior

was investigated in lab studies to determine if secondary transfer from adult cockroaches to nymphs is possible utilizing a new Syngenta cockroach bait containing emamectin benzoate. The study was conducted on bait-averse and non-bait averse strains of the German cockroach, Results showed consumption of fecal matter produced by females fed Optigard cockroach bait delivered greater than 95% mortality by 7 Days in both non-bait averse and bait averse nymphs.

PSYLLID AND CITRUS GREENING SYMPOSIUM

Avery, P. B., W.B. Hunter, D.G. Hall, M. A. Jackson, C. A. Powell & M. E. Rogers. **Providing assistance in development and evaluation of psyllid management programs for east coast citrus growers.**

Psyllid problems that citrus growers are having on the Florida East Coast and research projects designed to address these problems, based on field observations and evaluations, will be discussed. Pesticide use limits on fresh fruit for export make biorationals desirable for psyllid control. Results of the use of *Paecilomyces fumosoroseus* and other management strategies will be outlined.

Hall, D. G., E. J. Wenninger, L. Stelinski & R. Mankin. **Reproductive biology and behavior of the Asian citrus psyllid.**

A review of research conducted during 2006-2008 on the reproductive biology and behavior of the Asian citrus psyllid (*Diaphorina citri*) will be presented. Information to be discussed will include daily patterns of mating; frequency of mating; pre-mating and pre-oviposition intervals; daily and seasonal patterns of abdominal color; and acoustic communication between sexes.

Sétamou, Mamoudou, M. Skaria & J. da Graça. **Texas situation of Asian citrus psyllid and citrus greening disease.**

The distribution of the Asian citrus psyllid (*Diaphorina citri*) and current status of Huanglongbing in Texas will be presented. Data on population densities of this insect in citrus orchards and a brief discussion on the reasons of lower psyllid densities recorded in Texas relative to Florida will also be provided. The ongoing area-wide management program and its impact on *D. citri* populations in Texas citrus will be described.

Stansly, P. A. & J. A. Qureshi. **Biologically based management of the citrus Psylla *Diaphorina citri* and Huanglongbing in Florida.**

Life table studies in the field have shown that in the absence of insecticides, mortality of unprotected citrus psyllids in Florida is greater than 90% compared to 10 – 20% for psyllids protected in mesh sleeve cages. This mortality is due primarily to predation from ladybeetles, lacewing larvae and others. The exotic parasitoid, *Tamarixia radiata* is distributed throughout the state, although its major impact appears to be limited to late season, so additional parasitoid species and biotypes are being released. Management strategies that conserve the biotic component of mortality are likely to be more sustainable than total reliance on insecticides. However, few effective insecticides are compatible with natural enemies when applied as foliar sprays during the growing season. On the other hand, broad spectrum insecticides applied during the dormant

season suppress overwintering psyllid adults with relatively little collateral damage to beneficial arthropods that are in low numbers or cryptic habitats during the cooler months. Fewer psyllids and a normal predator complex colonizing the spring flush suppresses the pest explosion and consequent movement of greening that would otherwise occur in response to unlimited food and ideal ambient conditions. Systemic insecticides applied to the soil are another method of delivering a toxic dose to the pest with relatively little exposure of natural enemies. Additional compatible means of surpassing psyllids during the growing season such as frequent, low volume applications of horticultural spray oil with without selective insecticides or entomopathogenic fungi are being evaluated.

Stelinski, L., E. J. Wenninger, E. Onagbola & D. G. Hall. **Chemical ecology of *Diaphorina citri*.**

Investigations of psyllid behavior in laboratory olfactometers have provided behavioral evidence for a female-produced volatile sex attractant pheromone in *D. citri*. Furthermore, citrus volatiles have been found to attract both sexes of *D. citri*, while guava volatiles have been found to repel this insect. Five olfactory and at least three mechanosensory sensillar types were characterized on psyllid antennae. Analytical techniques have been used to isolate and identify active compounds from both citrus and guava.

THRIPS SYMPOSIUM

Arevalo, H. A., A. B. Fraulo & O. E. Liburd. **Importance, sampling, and management of flower thrips in blueberries and strawberries in Florida**.

Flower thrips are an insect pest assemblage that damage berry crops such as blueberries and strawberries in Florida. These insects are attracted to flowers, and damage floral structures and fruits in such way that they reduce the quality and quantity of the berries. Thrips populations are correlated with flowering season, thus their management is time sensitive, and correlated with plant phenology. Management alternatives include chemical and biological control as part of an IPM program.

Funderburk J. **Management programs for fruiting vegetables.**

Feeding by the western flower thrips, *Frankliniella occidentalis* (Pergande), causes damage to the fruits of vegetables, and the species is the key vector of *Tomato spotted wilt tospovirus*. *Frankliniella tritici* (Fitch) and *Frankliniella bispinosa* (Morgan) are not pests of fruiting vegetables. Both species compete with western flower thrips. Effective management of the western flower thrips in pepper and eggplant integrates conservation of populations of the natural predator, *Orius insidiosus* (Say), with the use of reduced-risk insecticides such as spinetoram for the control of western flower thrips and other pests. Natural infestations of *O. insidiosus* are very effective predators and their effectiveness is predictable based on the number of the predator relative to the number of thrips prey. Populations of western flower thrips resurge when natural enemies and competing thrips are killed. Some insecticides especially pyrethroids have beneficial effects on the development and reproduction of western flower thrips. The predator *O. insidiosus* does not prefer tomato, and numbers remain too low in fields to suppress

thrips. Tomato growers primarily rely on the use of ultra-violet reflective mulch combined, if needed, with the use of effective insecticides. Additional management efforts are needed in the future to manage western flower thrips and other difficult pests in space and time. Management of the pepper weevil (*Anthonomus eugenii* Cano) is proving a challenge to pepper growers in central and southern Florida trying at the same time to manage western flower thrips. Growers need to emphasize sanitation and other cultural tactics over broad-spectrum insecticides that kill *O. insidiosus* and induce western flower thrips in other ways. The identification of thrips in scouting programs also is critical as the use of broad-spectrum insecticides against populations of the non-pest flower thrips is inducing western flower thrips populations to pest status.

Gillett, J. L., N. C. Leppla, A. C. Hodges & J. L. Merritt. **Education and training to increase adoption of IPM for Western Flower Thrips.**

The University of Florida, IFAS IPM Florida and Southern Plant Diagnostic Network (SPDN) are cooperatively developing education and training specifically to increase integrated pest management (IPM) of western flower thrips (WFT). Management of WFT is exacerbated by the difficulty in identifying thrips species and by the tendency of thrips to develop resistance to insecticides. Therefore, education and training will emphasize workshops on identification of thrips; insecticide resistance management protocols; description of the effects of insecticides on natural enemies, e.g., *Orius* spp.; and use of the Grower's IPM Guide for Florida Tomato and Pepper Production. Thrips identification aids, such as a national field-based identification deck currently under development by the SPDN, will be useful to Florida growers. This kind of information will be delivered through Extension programs, e.g., in-service training, field days and classroom education. A section of the IPM Florida website devoted to thrips in vegetable crops (pepper, tomato, strawberry, egg plant, beans) will contain: 1. WFT biology and ecology, 2. Specific management tactics incorporated into an IPM program that is crop and location specific, 3. Identification of thrips and natural enemies in scouting programs, 4. Practices that reduce damaging pest populations in space and time, 5. Problems with managing WFT and other pests, 6. Updated, crop and location specific information on population levels, and 8. Results of resistance monitoring. Future needs for specific in-service or other education and training, including advanced diagnostic training sessions, will be determined by clientele groups. Adoption of IPM for WFT will befit the growers by minimizing insecticide resistance and maximizing cultural practices and biological controls, such as *Orius* spp.

Mellinger, C. & G. Frantz. **Shifts in population abundance and damage.**

Since the first report of Florida establishment in 1981, the western flower thrips, *Frankliniella occidentalis*, has caused economic damage to vegetable crops, notably tomatoes and peppers. Recent observations in Florida and Virginia indicate that economic thresholds are exceeded as native thrips species are displaced. Likely displacement mechanisms include seasonal abundance cycles of *F. bispinosa* and *F. tritici* and differential insecticide toxicity to crop infesting thrips and their primary predator, the minute pirate bug, *Orius insidiosus*.

Reitz**,** S. R. **Biology and ecology of the Western Flower Thrips (Thysanoptera: Thripidae): The making of a pest.**

In the past 30 years, the western flower thrips has become one of the most important agricultural pests worldwide. Certain biological attributes of this insect predispose it to be a direct pest across a wide range of crops. In addition to the direct damage it can cause, this species is an efficient vector of *Tomato spotted wilt virus* and other *Tospoviruses.* This review addresses questions regarding the biological and ecological attributes of the western flower thrips that enable it become a significant pest and make it so difficult to manage. Among these important life history traits are the western flower thrips' polyphagy and tendency to reside and feed in concealed areas of flowers and fruits. Consequently, large populations can develop and disperse into crops. The larvae and adults feed in a similar manner and can share the same host plant resources. The relatively short generation time and haplodiploid sex determination also contribute to the pest status of this species. These life history traits interact in complex ways to make the western flower thrips one of the world's most significant pests.

ORAL PRESENTATIONS

Boykin L. M., P. D. Barro, D. G. Hall, W. B. Hunter & R.G. Shatters, Jr. **Bayesian phylogenetic analysis of mitochondrial COI DNA sequence groups of Asian Citrus Psyllid, *Diaphorina citri* Kuwayama, the vector for citrus greening disease, Huanglongbing reveals two major phylogenetic groups.**

We utilized a Bayesian phylogenetic technique to resolve global relationships of *Diaphorina citri*. New mitochondrial primers were designed from an EST library and an 800 base pair region of COI amplified and sequenced. The dataset consisted of 281 individual psyllids from around the world. There are several well-supported clades within the phylogeny. The global relationships will be discussed including what geographic region appears to be the source of the introduction into Florida.

Cherry, R. **The effect of reduced risk herbicide on Fall Armyworm and Tropical Sod webworm.**

Reduced risk herbicide is a petroleum based herbicide to be released for broadleaf weed control in St. Augustinegrass. Laboratory and field data show that the herbicide also helps reduce some lepidopteran populations

Cherry, R., P. Stansly, J. Sampson & A. Wilson. **Abundance and spatial distribution of wireworms in Florida sugarcane fields on muck versus sandy fields.**

There were no significant differences in densities of *Glyphonyx bimarginatus*, *Melanotus communis*, or total wireworms of all species in muck versus sand fields. Significantly more *Conoderus* spp. were found in sandy fields and significantly more *Ischiodonatus* sp. were found in muck fields.

Duncan, R. E., J. E. Peña, W. Roltsch, R. Gagne, T. Henry & C. Holguin. **Potential of exotic and resident biological control agents of the avocado lace bug, *Pseudacysta perseae* (Heteroptera: Tingidae) in Florida.**

The avocado lace bug, *Pseudacysta perseae* (Heteroptera:Tingidae) once considered a minor pest, now regularly causes extensive damage to cultivated avocado in the Caribbean Region and Northern South America. The avocado lace bug, recently established in California, USA. We report on the discovery of two new natural enemies of *P. perseae* in Florida: the plant bug *Stethoconus praefectus* (Distant) (Deraecorinae ; tribe Hyaliodini) , the second host-specific lace bug predator established in the Western Hemisphere and on the discovery of a new genus and species of a cecidomyiid, *Tingidoletes praelonga* Gagné. We also report on the potential of the egg parasitoid *Erythmelus klopomohor* (Hymenoptera: Mymaridae) and the results of life table studies to determine the potential of the Florida biotic mortality factors on this pest.

Hunsberger, A., M. Lamberts, H. Mayer & C. Mannion. **A New invasive pest - how UF extension educates others about the Fig whitefly.**

In August 2007, the UF/IFAS Miami-Dade County Extension office began receiving numerous phone calls about a new problem with *Ficus* hedges. The cause was identified as the fig whitefly *Singhiella simplex* (Singh) in October 2007. Soon afterwards, we conducted several workshops, town hall meetings, developed fact sheets and a bilingual video podcast showing proper pesticide application techniques as well as conducting a "media blitz" to raise awareness on how to manage this serious new pest.

Jiang, Y., J. Clauson & M. Page. **Establishment of statewide mosquito surveillance information system in Florida.**

DACS has initiated a Statewide Mosquito Surveillance Information System (SMSIS). Mosquito species, relative abundance, trapping methods, collection date and geographical information submitted by the participating MCDs are processed and a weekly summary report is formed and sent out to all the mosquito control districts for their references. A real-time mosquito surveillance map is generated to show the surveillance sites. It is our hope that this system would benefit mosquito control in the State of Florida.

Peña, J. E., R. E. Duncan & D. Carrillo. **The red palm mite, *Raoiella indica* (Acari: Tenuipalpidae): pre- and post-infestation surveys to determine potential of natural enemies in Florida.**

A survey was conducted in south Florida from 2005 through 2007 to determine the phytophagous and beneficial micro-arthropod fauna inhabiting different palm species and bananas before the arrival of the red palm mite, *Raoiella indica* (Acari: Tenuipalpidae) into Florida. After the discovery of mite infestations in Palm Beach and Broward counties, in December, 2007, an additional monthly survey was undertaken to register the dynamics of the mite and the dynamics of its natural enemies. The mite, *Amblyseius largoensis* (Acari: Phytoseiid) was collected from coconuts and appears to be one of the natural enemies feeding on the red palm mite. Other predators that might show potential are: *Stethorus utilis* (Coleoptera: Coccinellidae) and an unidentified thrips species.

Lapointe, S. L., T. Evens, R. Niedz & L. Stelinski. **Geometric designs and modeling response surfaces for applications in entomology: diets and pheromones as mixtures.**

The entomological literature is replete with inappropriate design and analysis. A common problem is post hoc comparisons to measure responses to graded variables when such comparisons were not part of the original rationale. Studies often seek optimal responses to continuously varied mixture components wherein proportionality of one component cannot be varied independently. Geometric designs allow systematic and efficient exploration of multi-dimensional experimental space. Optimization of insect diets and pheromone blends will be presented as examples.

Mankin, R. W. & A. Moore. **Investigation of acoustic sensors to detect coconut rhinoceros beetle in Guam.**

The coconut rhinoceros beetle, *Oryctes rhinoceros*, was accidentally introduced into Guam last year and now threatens the island's forests and tourist industry. These large insects can be detected easily with acoustic sensors, and procedures are being developed to incorporate acoustic technology into eradication programs.

McKenzie, C. L., L. Boykin, R. G. Shatters, Jr., G. Hodges, L. S. Osborne & F. Byrne. **Extensive survey of *Bemisia tabaci* biotypes in Florida – investigating the "Q" invasion.**

After the discovery of the *Bemisia tabaci* Q biotype in the U.S., there was an urgent need to determine its spread. As part of a coordinated whole country survey, an extensive survey of *Bemisia tabaci* biotypes was conducted in Florida through cooperation with growers and state agencies. This was done to monitor the distribution of both the B and Q biotypes. Biotype status of submitted *Bemisia tabaci* samples was determined using a mitochondrial Cytochrome Oxidase I subunit (mtCOI) gene sequence, unique microsatellite markers and esterase zymogram analysis. 186 collections were sampled from 23 counties. Of these samples, 54% were from vegetables and 46% were from ornamentals. 16% of all collections were found to be the Q biotype and they represented six counties, all of which were on ornamentals and herbs in greenhouses. Sequence comparison of the mtCOI gene identified three separate haplotypes within Florida that were defined as X, Y and Z. Haplotypes could be used to associate populations known to be related by grower and plant type. For example, collections from five counties were made on hibiscus linked to the same grower and all samples contained only the X haplotype. Other populations contained a mix of either the Y and Z haplotypes or the Y and X haplotypes, supporting the conclusion that the Q biotype must have entered Florida through at least two separate introductions. Our data also show that two microsatellite markers are a cost effective diagnostic alternatives for biotype ID with 100% concurrence with mtCOI sequence data.

Meagher, R. L. **Parasitization of fall armyworm by the eulophid parasitoid *Euplectrus platyhypenae.***

Fall armyworm, *Spodoptera frugiperda* (J. E. Smith), is attacked by parasitoids from several different families of Hymenoptera and Diptera. One species, *Euplectrus platyhypenae* Howard (Hymenoptera: Eulophidae), has been consistently recovered from

larvae in whorl-stage corn and from larvae feeding in pasture grasses. This species is a gregarious larval ectoparasitoid attacking all stages of larvae except neonates. Parasitization rates for this species have been as high as 53% in spring-planted corn in Alachua Co., although the average rate for the last two years has been 22.3%. This parasitoid is easy to culture in the laboratory and future studies will determine if timely releases will help reduce fall armyworm populations.

Merritt, J. L., N. C. Leppla & R. J. McGovern. **Recent advancements in the UF/IFAS Plant Medicine Program.**

The University of Florida Plant Medicine Program awards a Doctor of Plant Medicine (DPM) degree. Advancements are continually made in coursework and internships in Entomology, Nematology, Plant Pathology, Agronomy, Horticultural Science, and Soil Science. Consequently, plant doctors are highly educated and trained to handle current aspects of prevention, diagnosis and management of plant health problems. DPM graduates are in demand to work in crop consulting, Extension, research, teaching, and federal and state regulatory agencies.

Mizell, R. F. III, D. Paini & C. Gomez. **Manipulation of ladybeetle species with visual and odor-gustatory cues.**

Lady beetles (Coccinellidae) are common predators of many pests and one of the most recognized and beloved insects the world over. They have been widely researched and are generally highly important as natural biological control agents, but mostly ineffective when used in augmentative releases. We investigated and will discuss some methods that exploit visual and odor-gustatory cues to manipulate several species of naturally occurring ladybeetles to increase there "local" impact as biological control agents.

Qureshi, J. A., M. E. Rogers, D. G. Hall & P. A. Stansly. **Incidence of the Asian citrus psyllid, *Diaphorina citri* (Hemiptera: Psyllidae) and its parasitoid *Tamarixia radiata* (Hymenoptera: Eulophidae) in Florida citrus.**

Diaphorina citri Kuwayama, vectors the bacterium *Candidatus* Liberibacter asiaticus, one of the causal organisms of the devastating citrus disease "huanglongbing" or citrus greening. In the United States, *D. citri* was first discovered in Florida, in 1998. *Tamarixia radiata* Waterston, was imported from Asia and released in Florida in 1999-2001 to improve biological control of *D. citri* before citrus greening was detected in Florida in 2005. Florida citrus groves were surveyed during 2006-2007 for *D. citri* and *T. radiata*. Results showed that *D. citri* was established in all 28 citrus groves surveyed across 16 counties. Adult populations averaged 3.52, 1.27, and 1.66 individuals per "tap" sample at locations in the central, southwest, and eastern coastal regions, respectively. Citrus shoots infested with psyllid eggs or nymphs averaged 67, 44, and 45% in the central, southwest, and eastern coastal regions, respectively. *T. radiata* was recovered from fourth and fifth instar psyllid nymphs at 26 of the 28 locations. However, apparent parasitism rates were variable and averaged less than 20% during spring and summer over all locations. Incidence of parasitism increased during fall at some locations, averaging 39% in September and 56% in November in the central and southwest regions, respectively. These parasitism rates were lower than reported in other countries, where

planned or accidental introductions of the parasitoid and significant suppression of the psyllid have been reported. Therefore, further efforts are warranted to enhance the biological control of *D. citri* and thereby reduce psyllid populations and spread of citrus greening.

Scheffrahn, R. H., J. Křeček, R. Ripa & P. Luppichini. **Endemic origin and vast anthropogenic dispersal of the West Indian drywood termite, *Cryptotermes brevis* (Isoptera: Kalotermitidae).**

Cryptotermes brevis is a widespread pest of structural lumber. Until now, no endemic locality was known. A 2007 termite survey of the coastal deserts of Chile and Peru yielded 61 endemic populations of *C. brevis* taken from 23 different host woods at 19 localities. We propose climatic and biological factors that favor or limit *C. brevis* distribution. We also suggest a scenario implicating shipboard infestations of the Spanish Empire's fleet in the release of *C. brevis* throughout and beyond the Caribbean Basin.

Seal, D. R. (Dak). **Present status of melon thrips, *Thrips palmi* Karny and Western flower thrips, *Frankliniella occidentalis* (Pergande), Thripidae, Thysanoptera in various vegetable plantings.**

Studies were conducted in 2007-2008 vegetable season to determine abundance of melon thrips and western flower thrips in squash and pepper fields in Homestead, FL. Melon thrips population abundance was significantly high in squash fields and low in pepper fields. On the other hand, western flower thrips population was higher than the melon thrips in pepper fields. In cucumber plantings, western flower thrips dominated in October 2007 to January 2008 and declined thereafter.

Shapiro, J. P. & P.D. Shirk. **Two Orius species in North Central Florida: ecology and physiology.**

Orius insidiosus and *Orius pumilio* were shown to exist concurrently in North Central Florida on the same host. The little-known *O. pumilio* has been previously described as a South Florida or tropical species. Both have now been studied in the laboratory as physiological subjects.

BIOCONTROL SYMPOSIUM

Cave, R. D. **Good bugs versus bad bugs at the UF biological control research & containment laboratory.**

One of the two research programs at the UF Biological Control Research & Containment Laboratory in Ft. Pierce focuses on the natural enemies of invasive insects. Three specific projects are targeting the Mexican bromeliad weevil (*Metamasius quadrilineatus*), the cycad aulacaspis scale (*Aulacaspis yasumatsui*), and the yellowmargined leaf beetle (*Microtheca ochroloma*). A parasitic fly (*Lixadmontia franki*) from Honduras is being mass reared and released to reduce populations of the weevil. A lady beetle (*Phaenochilus* sp.) and parasitic wasp (*Arrhenophagus chionaspidis*) from Asia are being studied as potential biological control agents of the scale, as well as a commercially available lady beetle (*Rhyzobius lophanthae*). Commercially available

predators (*Podisus maculiventris*, *Chrysoperla rufilabris*) are being evaluated for controlling the leaf beetle in organic gardens. Other potential targets for research projects are discussed.

Cuda , J. P., J. C. Medal, W. A. Overholt & J. H. Pedrosa-Macedo. **Overview of biological control of Brazilian peppertree.**

Brazilian peppertree (BP), *Schinus terebinthifolius* Raddi (Anacardiaceae), is a highly invasive weed in Florida. In the 1980s, BP was identified as a suitable target for classical biocontrol. Several natural enemies were identified from surveys conducted in Brazil and Paraguay as potential biocontrol agents because they visibly damaged the plant in its native range. Biological and host range studies have been completed on a sawfly, a thrips and leafrolling moth. A stem boring weevil, a psyllid, and a fungus also are being investigated for their biocontrol potential.

Diaz, R., W. A. Overholt, J. P. Cuda & P. Pratt. **Biology, host specificity and potential impacts of *Ischnodemus variegatus* (Hemiptera), an herbivore of West Indian Marsh Grass (*Hymenachne amplexicaulis*) in Florida.**

West Indian Marsh Grass, *Hymenachne amplexicaulis* (Rudge) Nees, is currently invading the watersheds of central and south Florida. This grass is native to South America and the West Indies and has spread to most countries of the neo-tropics. An adventive insect was found in 2003 causing severe damage to *H. amplexicaulis* in Florida. This insect was identified as *Ischnodemus variegatus* (Hemiptera) and it is considered native to South America. Little information is known about *I. variegatus* biology, ecology and its potential to control *H. amplexicaulis* in Florida. Therefore, the biology, host range and its potential to control *H. amplexicaulis* were evaluated under laboratory and greenhouse conditions. The lower thresholds to complete development (egg to adult) estimated with the linear and nonlinear model were 14.6 and 17.4C, respectively. The total degree-days required to complete development estimated by the linear model was 588. Host range tests included taxonomically related species, grasses grown as food crops, turf grasses used in Florida, and grasses with ecological similarities to the target plant. We tested 57 plants under no-choice conditions for development and five plants for oviposition. Complete development was obtained on *H. amplexicaulis* (23.4% survivorship), *Panicum repens* (0.4%), *Panicum anceps* (2.2%) and *Thalia geniculata* (0.3%). Oviposition choice tests demonstrated that I. variegatus females can lay eggs on several non-target grasses. A factorial experiment with different levels of nutrients, water levels and I. variegatus density was performed under greenhouse conditions. No interaction was detected between water level and insect density for all variables analyzed. High infestations (10 insects/plant) of *I. variegatus* were capable of reducing the growth rate, chlorophyll levels and biomass of *H. amplexicaulis* seedlings. Early damage of *I. variegatus* to *H. amplexicaulis* seedlings is characterized by brown rounded necrotic spots on the leaf. If the infestation continues, the plant turns brown and dies. The major damage to the grass occurs by withdrawal of fluids from phloem and the stoppage of vascular tissues by sheath material left by the mouth parts. Field sampling of natural infestations conducted in the Myakka River State Park (Sarasota Co.) showed that *I. variegatus* increase from May to October reaching up to 30 insects per stem. Despite

the high densities of *I. variegatus*, only a small decrease of chlorophyll content and panicle length was detected in full grown *H. amplexicaulis* stands.

Hoy, M. A. & H. Bowman. **Classical biological control of the red palm mite: status and prospects.**

The red palm mite *Raoiella indica* Hirst (Tenuipalpidae) invaded multiple islands in the Caribbean beginning in 2004 and was expected to invade Florida, as well. Prior to its discovery in Florida in late 2007, we began a classical biological control project, funded in part by USDA-APHIS. A literature review indicated that predatory mites (Phytoseiidae) were present in India and Mauritius, as well as several other localities, that might be good candidates for importation, evaluation, and possible release. After obtaining importation permits, M. A. Hoy traveled to Mauritius in September 2007 to collect phytoseiids with the assistance of scientists at the Ministry of Agroindustry. Colonies were obtained from 5 sites in Mauritius representing different climatic zones. These colonies are being evaluated in quarantine prior to making an application for possible release in Florida and elsewhere.

Manrique, V., J. P. Cuda, W. A. Overholt, D. Williams & G. Wheeler. **Evaluating the effect of Brazilian peppertree genotypes on the thrips *P. ichini*, implications for biological control.**

Brazilian peppertree (BP) *Schinus terebinthifolius* Raddi (Anacardiaceae) is native to South America, and is one of the most invasive weeds in Florida. Genetic studies have recognized two BP haplotypes (A and B) in Florida, and extensive hybridization has occurred between these two genotypes. In addition, genetic studies in the native range have identified nine cpDNA haplotypes (A, C–J), and haplotype D is the most common and widespread. The thrips *Pseudophilothrips ichini* Hood (Thysanoptera: Phlaeothripidae), a potential biocontrol agent of BP, was recommended for release in Florida by the TAG in May 2007. Both larval and adult stages damage the host plant by feeding on the growing shoot tips and flowers causing flower abortion. Genetically distinct populations of *P. ichini* have been found feeding on different plant genotypes in the native range. Therefore, the objective of this study was to compare the performance of two populations of *P. ichini* on all Florida BP genotypes, two Brazilian genotypes and a congener *Schinus molle* L. The two thrips populations were collected on BP Brazil A near Vicosa, and on BP Brazil D and C near Curitiba, Brazil. Survival to adult and time of development were recorded for each host plant, and 6-8 replicates per treatment were used for each thrips population. In a separate experiment, adult longevity was measured for each plant genotype including a treatment with no food. A third experiment was conducted to evaluate the host-plant preference of each population of *P. ichini*. Six newly emerged adult females were placed inside a Petri dish (15 cm diameter) containing six leaflet disks (2 cm diameter) of the different host plants: BP Florida A, BP Florida B, BP Florida hybrid A, BP Brazil A, BP Brazil D, and *S.molle*. In total 40 Petri dishes were used for each thrips population, and observations were conducted every half hour for a total of 4 hours. Results showed that the two populations of *P. ichini* differed significantly in their ability to utilize different genotypes of their host-plant. While poor survival to adult (0-4%) on Florida genotypes was obtained of thrips collected from BP Brazil D and C, higher survival (40-50%) was recorded of thrips collected on BP Brazil

A. The ecological significance of the results are discussed in the context of plant genotypes and possible local adaptation of their natural enemies.

Medal, J., N. Bustamante, W. Overholt, R. Diaz, P. Stansly, A. Roda, D. Amalin, K. Hibbard, R. Gaskalla, B. Sellers, S. Hight, J. Cuda & K. Gioeli. **Biological control of Tropical soda apple in Florida: current status.**

Tropical soda apple, *Solanum viarum* has invaded more than 400,000 hectares of grasslands. A biocontrol project was initiated in 1997. The South-American leaf beetle *Gratiana boliviana* was approved for field release in 2003. Approximately 120,000 beetles have been released in 29 counties in Florida. Plant defoliation ranges from 40 to 100%, and a decrease in fruit production from 40-60 to few fruits/plant have been observed in five of the release sites monitored.

Mizell, R. F. III, J. Herbert, D. Paini & C. Gomez. **Investigating landscape level movement by insect predators and its potential exploitation for enhancing biological control.**

Generalist predators such as the Coccinellidae are important biological control agents in many habitats. Attempts to manipulate them to increase their impact in a number of crops and in the landscape have met with limited success. Many of these failures are the result of a lack of understanding of the behavior of predacious species and their interactions. This paper will discuss research to better understand coccinellid movement and related behaviors and their potential for exploitation.

Peña, J. E. and R. M. Baranowski. **A retrospective of 35 years of biological control in South Florida.**

The first efforts to establish a biological control program in southern Florida were initiated by the mid 70s with the collection, introduction, culture and release of parasitoids of the Caribbean fruit fly, *Anastrepha suspensa* (Diptera: Tephritidae). Approximately 15 species of parasitoids were collected or sent by other researchers to south Florida to combat this pest. Five years after the releases, Caribbean fruit fly captures were 40% lower than in the previous years. Since then, the biological control program has focused not only on Classical Biological Control, but also recognizing the presence and importance of native parasitoids and predators and their role on control of different pest species. Here we briefly summarize, efforts on classical biological control against *Diaprepes abbreviatus* (Coleoptera: Curculionidae), *Andaspis punicae* (Homoptera: Diaspididae), *Epimeces detexta, E. matronaria* (Lepidoptera: Geometridae) and we report examples of research that has resulted in the discovery of predators and parasitoids of pests of avocado *(*i.e., *Pseudacysta perseae*), lime *(Prodiplosis longifila, Phyllocnistis citrella, Polyphagotarsonemus latus*), and pests of other tropical fruit crops.

Porter, S. D. **Evaluation and field release of Pseudacteon decapitating flies as self-sustaining fire ant biocontrol agents.**

This talk will review the biology of fire ant decapitating flies in the genus, Pseudacteon and their use as fire ant biocontrol agents. The talk will focus on the stages of this biocontrol program; specifically, the discovery of these flies, host specificity testing, mass rearing, permits and field release. The talk will also discuss the current

status of each of the 5 species of flies that have been released or will soon be released in the United States.