Abstracts of the 2004 Florida Entomological Society Annual Meeting Presentations

Pioneer Lecture -

"Ross H. Arnett, Jr.: A True Pioneer in Entomology." Professor Charles W. O'Brien, Ph.D. Center for Biological Control, Florida A & M University, Tallahassee, FL.

Ross H. Arnett, Jr. was an outstanding Coleopterist and author and publisher of important entomological and botanical books. His books included *American Insects, The Beetles of the United States, The Naturalists Directory* and others. Ross served in the Army as a teacher of mosquito taxonomy in Panamá for 3 years and mustered out in 1945 as a Technical Sergeant. He returned to Cornell to obtain his Masters and Ph.D. degrees. In 1947, while still a student at Cornell University, he started the "Coleopterist's Bulletin". In 1971, Ross was instrumental in the organization of the "Coleopterist Society". He moved frequently during his career and came to Gainesville Florida in 1982, where he started a company called Flora and Fauna Publications, later sold to E. J. Brill publishers, with Ross continuing as editor. In 1985, Ross and Bob Woodruff started the "Center for Systematic Entomology" along with the journal "Insecta Mundi". During the 80 years of his life, Ross fathered eight children, was an outstanding taxonomist and facilitator, who could get disparate groups of individuals to work together to produce useful publications, and was a great friend. His legacy to Coleopterology will continue to be recognized for many decades and he will not be forgotten soon, not only by his friends, but especially by all who work with Coleoptera.

A biography of Dr. Charles W. O'Brien, Florida Entomological Society's 2004 Pioneer Lecturer:

Dr. Charles W. O'Brien will present the 2004 Pioneer Lecture at our upcoming meeting in honor of Dr. Ross Arnett. Dr. O'Brien was a friend of Dr. Arnett for nearly 40 years and shared Dr. Arnett's love and dedication to beetle taxonomy.

Dr. O'Brien received a B.A. in Entomology from the University of Connecticut at Storrs (1956). He went on to obtain an M.S. in Entomology at the University of Arizona at Tucson in 1958. He began pursuing his Ph.D. at the University of California, Berkeley, in 1958 but delayed his academic studies when he was hired as a field entomologist with the B.P. Bishop Museum, Honolulu, in 1959. Following 5 months of research in Antarctica for the Bishop Museum (for which he received the prestigious Congressional Medal for Antarctic Service), he went for 2 months to the foggy and rainy Southern Alps of New Zealand, traveling to the northern tip of the North Island. He then traveled by way of Australia and Papua New Guinea to the British Solomon Islands Protectorate to carry out mini-safaris with native Melanesian guides and carriers, living for 6 months in native villages in the mountains while collecting all groups of insects on five different islands. Dr. O'Brien returned to his Ph.D. program in 1960 at the University of California, Berkeley and graduated with a degree in Entomology in 1967.

Dr. O'Brien began his professional academic career as a Purdue Research Fellow in Agriculture at the Catholic University of Chile in Santiago (1967-1969) and then went to Texas Tech University, Lubbock, as Assistant Professor (1970-1972). He came to Tallahassee, Florida in 1972 as Associate Professor in Entomology at Florida A&M University (FAMU). Dr. O'Brien was promoted to full Professor in 1979 and remained at FAMU until he retired from full time work June 31, 2003. In August 2003, he returned to work one day per week for one more year to complete ongoing research on two of his many grants. He was the first Director of the joint FAMU-USDA Center for Biological Control from 1999-2003. Dr. O'Brien taught courses at FAMU in General Entomology, Insect Morphology, Medical Entomology, and Biological Control. Dr. O'Brien was responsible in whole or part for grants to FAMU totaling nearly $5 million during his tenure on the faculty. He has published more than 120 refereed journal articles and book chapters.

Internationally recognized as a world expert on the taxonomy of beetles, namely the weevils, Dr. O'Brien has traveled extensively throughout the U.S., Europe, Asia, Central and South America, the Caribbean, and Africa to study, teach, conduct research, present research findings, and serve as a consultant. Drs. Charles and Lois O'Brien are avid insect collectors and, through their travels and tireless efforts, have created two of the world's most substantial collections, one of weevils (his collection consists of more than one million weevil specimens) and one of Fulgoroidea, (her collection consists of more than a quarter of a million planthopper specimens).

Dr. O'Brien has been married for 42 years to Lois (Breimeier), who is also a Berkeley Ph.D. Entomology graduate. Dr. Lois O'Brien is an acknowledged World Class taxonomic specialist of Fulgoroidea (planthoppers). Dr. O'Brien will retire from FAMU August 31, this year. The O'Brien's will be leaving Tallahassee and moving to Arizona in January-February, where they will continue their world travels and entomological research.

DSP 1. Parasitoids of *Antichloris viridis* Druce, 1884 (Lepidoptera: Arctiidae) defoliator of plantain (*Musa* AAB, sub-group plantain cv. Hartón) in the eastern and southern region of lake Maracaibo, Venezuela. **Oscar Domínguez**, Raúl Ramírez, Eleodoro Inciarte, and María Burgos. Unidad Técnica Fitosanitaria, Facultad de Agronomía, La Universidad del Zulia, Maracaibo, Venezuela.

Antichloris viridis Druce, eggs, larvae and pupae, were collected from plantain (*Musa* AAB, sub-group plantain cv. Hartón) in the municipalities of Francisco Javier Pulgar, Colón and Baralt of the Zulia state, Venezuela, since May 1999 until November 2002. Five species of hymenopteran parasitoids were recovered representing three families: Braconidae (Microgastrinae); Scelionidae (*Telenomus* sp.) and Chalcididae [*Brachymeria mnestor* (Walker), *Conura immaculata* (Cresson) and *Conura* sp.). The most widely distributed species was *B. mnestor* occurring in 14 collections

of 39 from the municipalities.

DSP 2. Establishment and range of parasitoids released for biological control of *Diaprepes abbreviatus* in Florida. **J. E. Peña**, D. Amalin, R. Duncan, D. Hall, C. McCoy, R. Nguyen, A. Hoyte, S. Lapointe, P. Stansly, and R. Adair. University of Florida/IFAS, Tropical Research and Education Center, 18905 SW 280th Street, Homestead, FL 33031.

A classical biological control effort was initiated in 1997 as part of the IPM program for *Diaprepes abbreviatus* (Coleoptera: Curculionidae). This effort combined foreign exploration, quarantine studies, production, release and recovery efforts of the Caribbean parasitoids *Quadrastichus haitiensis* (Gahan) [=*Tetrastichus haitiensis*] and *Aprostocetus vaquitarum* (Hymenoptera: Eulophidae). *Quadrastichus haitiensis* (Gahan) (Qh) introduced from Puerto Rico and released in 1998 throughout Florida. *Aprostocetus vaquitarum* (Wolcott) [=*A. gala*] (Hymenoptera: Eulophidae) (Av) is an ectoparasitoid introduced in 2000 from Dominican Republic. Release and recovery efforts were primarily aimed at establishing both parasitoids in multiple locations using caged and open field releases. Here we summarize recoveries and current relative abundance of the parasitoids in different study areas of Florida. The parasitoids *A. vaquitarum* and *Q. haitiensis* were recovered in south, mid and central Florida. The parasitoids are currently established in southern Florida, resulting in 60% mortality to weevil egg masses.

DSP 3. Life cycle and development of *Quadrastichus haitiensis* (Hymenoptera: Eulophidae): A parasitoid of *Diaprepes abbreviatus*. **José Castillo** and J. E. Peña, University of Florida/IFAS, Tropical Research and Education Center, 18905 SW 280th Street, Homestead, FL 33031.

An egg endoparasitoid, *Quadrastichus (Tetrastichus) haitiensis* (Gahan) (Hymenoptera: Eulophidae) was released during the 1970's in central (Apopka) and southeastern Florida (West Palm Beach), but failed to establish (Beavers and Selhime 1975). It was reintroduced into Florida from Puerto Rico by D. Hall, R. Nguyen and P. Stansly during 1998 and released in 2000. The parasitoid is currently established in Dade County, Florida but it has not established in other parts of Florida. The objective of this investigation was to determine the life cycle of *Quadrastichus haitiensis* as well as the influence of temperature and photoperiod on the development of this parasitoid. Developmental time from egg to adult for *Q. haitiensis* decreased with increasing temperatures. Shortest parasitoid development was observed at 30EC and longest at 20EC. No development was observed at constant temperatures of 15EC or 5EC. However, the emergence of *Q. haitiensis* was not reduced if parasitized egg masses at different stages of parasitoid development were exposed for 1 h to freezing temperatures (0EC). It is not known, if parasitoid development is reduced if freezing temperatures are longer than 1 hour. Developmental times in days, from egg to adult, were 12.75 to 18.75 d for 30EC, 16.75 to 29.95 d for 25EC and 39.37 to 46.37 d for 20EC. Percent successful parasitism was reduced at 15, 20, and 30EC compared to the highest parasitism observed at 25EC. Parasitoid development was not affected by different photoperiods at 30EC;

DSP 4. Body weight and biochemical comparisons of field and laboratory populations of *Podisus maculiventris* (Heteroptera: Pentatomidae). **Jeffory E. Head**, Jesusa C. Legaspi, and Jeffrey P. Shapiro. USDA Center for Biological Control, 6383 Mahan Dr., Tallahassee, FL 32308.

Body weight comparison and biochemical analysis of laboratory reared and field collected spined soldier bug (SSB) were done and it was found that female laboratory reared SSB were significantly heavier than females collected in the field. Biochemical analysis showed no difference in yolk proteins but higher amounts of soluble proteins in lab females.

DSP 5. A preliminary bibliographical survey of the Lepidoptera of the Henri Pittier National Park, Venezuela. María Fernanda Sandoval, Alberto Fernández Badillo, and **Jorge M. González**. University of Georgia, Department of Entomology, Athens, GA 30602.

Based mainly on bibliographical reports, we document 1.436 species of Lepidoptera representing 55 families. The park has an area of 107.800 hectares, much of which has not been well collected, except for the vicinity of Portachuelo and the Rancho Grande Biological Station area. Thus, more than 50% of the species that likely occur in the park have not yet been collected or studied.

DSP 6. Mass aggregations of *Polistes versicolor* (Oliver) (Hymenoptera: Vespidae) along the Northern Cordillera of Venezuela. **Jorge M. González**, José Piñango, Esteban Blanco D., and Robert W. Matthews. University of Georgia, Department of Entomology, Athens, GA 30602.

Mass aggregations of diapausing *P. versicolor* are observed at different sites during the Venezuelan dry season. *P. versicolor* occupies areas where food supply seems to be abundant all year round and the overall temperature is rather stable in tropical Venezuela, so there seems to be no basis for a seasonal diapause. The phenomenon is compared with a population in Brazil where the same wasp also has been reported to aggregate.

DSP 7. Some aspects of the Natural History of *Melittobia sosui* Dahms, a Japanese parasitoid wasp (Hymenoptera: Eulophidae) and comparison with other *Melittobia* species. **Jorge M. González**, Jun Abe, and Robert W. Matthews. University of Georgia, Department of Entomology, Athens, GA 30602.

Life history, development time, sex ratio and offspring production of *Melittobia sosui* reared with wild, facultative and factitious hosts is presented. Comparisons on these and other biological aspects are made with other previously reported data for other *Melittobia* species. Development time is slightly shorter than reported in other species. Offspring produced and sex ratio are similar to those reported for other species on the same hosts and fall within the expected range in the genus.

DSP 8. Life cycle of *Anartia jatrophae* (Linnaeus 1763) (Lepidoptera : Nymphalidae), in semi-captivity conditions. **Esteban Blanco D.**, Jose Piñango, Juan C. Navarro, and Jorge M. González. Parque Zoológico El Pinar, El Paraiso, Caracas, Venezuela.

The natural history of *A. jatrophae* reared at El Pinar Zoo Insectarium, Venezuela is described. The research was done from July to October, 2003. Same age eggs (58) were collected and their life cycle was studied rearing them on *Plantago major* (Plantaginaceae), which appears to be a first report as host. One third of the individuals (33%) arrived at the V instar. Three color morphs were observed among larvae. Sex ratio was 1:1.

DSP 9. Deforestation and mosquito distributions in the Peruvian Amazon. **Stephen P. Yanoviak**, L. P. Lounibos, S. C. Weaver, and R. Tesh. Univ. of Florida Medical Entomology Lab, 200 9th Street SE, Vero Beach, FL 32962

As part of a large arbovirus ecology project, we assessed differences in general properties of adult mosquito assemblages along a deforestation gradient in the Peruvian Amazon. Light traps and human landing collections showed no difference in mosquito abundance and species richness among habitat types, but hamster-baited traps collected fewer species and individuals in subsistence farms than in forested areas. Several mosquito species [e.g., *Culex* (*Melanoconion*) *pedroi*] differed in relative abundance among focal habitats.

DSP 10. Susceptibility of *Diaprepes abbreviatus* to novel isolates of *Bacillus thuringiensis*. **A. A. Weathersbee III** and S. L. Lapointe. USDA-ARS, US Horticultural Research Laboratory, Fort Pierce, FL.

Bacillus thuringiensis is being explored as a biological control agent for *Diaprepes abbreviatus*. A collection of potentially active isolates was assembled for testing against weevil larvae. The collection contains patented isolates and others isolated from field-collected weevil larvae. Significant activity was observed for some isolates in feeding bioassays against weevil larvae. Effective rates were determined for active isolates. Novel *B. thuringiensis* endotoxins discovered may be used to develop transgenic approaches to control as deemed appropriate.

DSP 11. Sampling and behavioral response of sap beetles to strawberries. **Crystal A. Kelts** and Oscar E. Liburd. Entomology and Nematology Department, University of Florida, Gainesville, FL.

Sap beetle populations in strawberries were examined to understand their response to developmental stages of the fruit. Four treatments with eight replicates were sampled for sap beetles. Treatments included dry, ripe, and over-ripe strawberries and ground litter. Results indicated that over-ripe strawberries had significantly more sap beetles than other treatments. Analysis of volatiles from different strawberry treatments using GC-Mass Spec techniques indicated that over-ripe strawberries were richer in volatile composition compared with other strawberry treatments.

DSP 12. Hormone and protein supplement therapy to improve efficacy of SIT for tephritid fruit flies. Peter E. A. Teal, **Barbara D. Dueben**, Shelley R. Olson, Y. Gomez-Simuta, and Timothy Holler. USDA/ARS, Center for Medical, Agricultural and Veterinary Entomology, Gainesville, FL.

An effective method for control of tephritid fruit flies is the Sterile Insect Technique in which large numbers of sterilized males are released into the wild population and mate with wild females who lay unfertilized eggs. Incorporation of hormone supplement therapy using stable analogs of juvenile hormone, like methoprene into rearing protocols and providing adult sterile males with appropriate amounts of protein in their diet optimizes pheromone communication and greatly enhances efficacy of SIT.

DSP 13. Herbivory by the Melaleuca psyllid, *Boreioglycaspis melaleucae*, induces premature leaf senescence of the invasive tree *Melaleuca quinquenervia*. **Shannon Morath**, Cressida Silvers, and Paul Pratt. USDA/ARS, Ft. Lauderdale, FL.

A common theme among stylet-feeding herbivorous insects is foliage degradation and a reduction in photosynthesis over time, while some plants are not appreciably affected by feeding. The rate at which leaves are differentially impacted and degraded has significant implications to host plant performance and fitness. Herein we quantify the effects of herbivory by the piercing-sucking insect *B. melaleucae* on leaf longevity, net photosynthesis, total chlorophyll content, and nutrient allocation of its host, the Australian tree *Melaleuca quinquenervia*.

DSP 14. Integrating biological and mechanical control methods for regrowth suppression of *Melaleuca quinquenervia* stumps. **M. Scott Wiggers**, Paul D Pratt, and Kirk Tonkel. USDA-ARS-IPRL, Ft. Lauderdale, FL.

Our study's goals were to 1) quantify the regenerative potential of *Melaleuca quinquenervia* cut stumps, 2) assess the influence of herbivory by *Oxyops vitiosa* and *Boreioglycaspis melaleucae* on this regenerative capacity, 3) determine the impact of pruning on stump regrowth, and 4) assess the interaction among pruning and herbivory treatments. Preliminary results indicate that integrating biological control agents with mechanical harvesting may be a satisfactory alternative to herbicides for suppression of melaleuca regrowth from stumps.

DSP 15. Biology and host plant preferences of the sugarcane beetle, *Euetheola humilis* (Coleoptera: Scarabaeidae). Tara P. Smith and **Abner M. Hammond**. Department of Entomology, LSU Agricultural Center, Baton Rouge, LA.

A new soil insect pest of sweetpotatoes is the sugarcane beetle, *Euetheola humilis* (Bermeister). The adult beetle feeds on the roots of sweetpotato. In Louisiana during 2002, sweetpotato growers reported losses exceeding 2 million dollars due to beetle damage. Determination of host plant preferences for feeding will be useful in adapting integrated pest management strategies for control of this pest. Results of choice tests and biology of the beetle will be presented.

DSP 16. Collection of *Mocis* spp. adults using floral volatile lures. **Robert L. Meagher, Jr.** USDA, ARS, CMAVE, Gainesville, FL.

Combinations of acetic acid and 3-methyl-1-butanol were used in standard Unitraps to collect male and female *Mocis* spp. moths. Different ratios of the two compounds were tested in three separate experiments located in an area of improved and natural grasses. Three species of *Mocis* were collected including *latipes, disserverans*, and *marcida*. More female moths were collected than males, and most females were mated.

DSP 17. Biology and management of *Phyllophaga* species that damage sweet potato in Louisiana. **Rick Story**, Aboubacar Diagne, and Abner Hammond. Entomology Department, LSU, Baton Rouge, LA.

The seasonal occurrence of adult *Phyllophaga* species associated with sweet potatoes as determined with pheromone traps will be presented. The attractiveness of several amino acid ratios (pheromone composition) for adult male *P. Ephilida*, and the life cycle determination of this species in south Louisiana will also be presented.

DSP 18. Deployment of a female sex pheromone lure for the pink hibiscus mealybug in Florida. **Stephen L. Lapointe**, and David G. Hall. USDA, ARS, U.S. Horticultural Research Laboratory, Fort Pierce, FL.

A lure based on synthetic female-generated sex pheromone components of the pink hibiscus mealybug, *Maconellicoccus hirsutus*, is being tested in southern Florida. The lure was elucidated from virgin females mass-reared on St. Croix, U.S. Virgin Islands. Males were chemically excluded from colonies through applications of the insect growth regulator pyriproxyfen (Distance®). Current data on seasonal phenology will be presented.

DSP 19. EST sequencing projects and their role in molecular-based IPM strategies. **Laura E. Hunnicutt**, Wayne Hunter, and Jerry Mozoruk. USDA, ARS, U.S. Horticultural Research Laboratory, Fort Pierce, FL.

Recent advances in genomic research have lead to the development of novel techniques that provide valuable insight into tissue or life-stage specific expression of the insect genome. EST sequencing projects can be used to identify genes which are necessary for normal insect physiology and development including those involved in wing formation, digestion, cuticle synthesis and egg production. Armed with this information, we are better able to develop pest management strategies that negate the action of such genes.

DSP 20. Identification of plant defense genes induced in response to insect herbivory and their use in transgenic plant development. **Jerry Mozoruk** and Laura Hunnicutt. USDA, ARS, U.S. Horticultural Research Laboratory, Fort Pierce, FL.

Elucidating the genetic mechanisms that underlie plant defense against insect herbivory has become increasingly important in the development of insect-resistant transgenic crops. By increasing the expression of suppressed genes or by harnessing the regulatory elements associated with induced but ineffective genes, it is possible to exploit these natural plant defense mechanisms. Research that explores these molecular responses by way of gene expression analysis is crucial to the progress of such novel control strategies.

DSP 21. What do we know about the Florida bromeliad weevil, *Metamasius mosieri*? **Patrick S. Duetting**, Ronald D. Cave, Olan R. Creel, Natalie K. Balcer, and Celia L. Branch. University of Florida, Institute of Food and Agricultural Sciences, Indian River Research and Education Center, Ft. Pierce, FL.

Little biological information is known for the Florida bromeliad weevil, *Metamasius mosieri* Barber 1920. In preparation for the non-target testing of a Honduran parasitic fly to control the Mexican bromeliad weevil, *Metamasius callizona* Chevrolat 1882, the biology and behavior of the Florida bromeliad weevil was studied. Data on developmental time, oviposition behavior, feeding behavior, host plants, and statewide distribution are herein reported.

1. Arizona cotton: a whitefly odyssey. **Peter C. Ellsworth**, S. E. Naranjo, and L. Cañas. University of Arizona.

Whiteflies (*Bemisia tabaci*, Biotype B; a.k.a. *B. argentifolii*) were the single most destabilizing force on agriculture in Arizona beginning in the early 1990s. Large strides were made in the discovery, development and deployment of management strategies that have resulted in an unprecedented recovery of cotton and the production of fall melons and other crops in this region. This presentation will survey the many building blocks that comprise this management system while pointing to key ecological and other insights that may be valuable to future improvements and translation into other systems.

2. Recent advances in whitefly (*Aleurotrachelus socialis* Bondar; Homoptera; Aleyrodidae) resistance in cassava (*Manihot esculenta* Crantz). **A. C. Bellotti**, A. Bohórquez, B. Arias, J. Vargas, H.L. Vargas, C. Mba, M.C. Duque, and J. Tohme. International Center for Tropical Agriculture (CIAT), Cali, Colombia.

Whiteflies cause considerable yield loss to cassava. The most economically important species in northern South America is *Aleurotrachelus socialis.* The cassava clone MEcu 72 consistently expressed the highest levels of resistance to *A. socialis.* A MEcu 72 (Resistant) x MBra 12 (Tolerant) cross resulted in a high yielding whitefly resistant genotype, CG489-31, commercially released by CORPOICA as Nataima-31. Research on genetics of resistance using micro satellite markers shows an association between molecular markers and resistance.

3. A historical perspective on whiteflies in Florida. **Greg Hodges**. FDACS-DPI, Gainesville, FL.

4. Squash silverleaf disorder and *Bemisia argentifolii*: etiology of the disorder, breeding for tolerance to zucchini squash, and effects on yield. **Heather J. McAuslane.** University of Florida, Gainesville, FL.

Squash silverleaf disorder is a systemic physiological disorder of Cucurbita species induced by feeding of immature silverleaf whiteflies. Zucchini breeding lines tolerant to SSL are not antibiotic or antixenotic to whiteflies but do not silver. Reciprocal grafting experiments indicate tolerance is at the level of the developing leaf not the whitefly-infested leaf. SSL-tolerant lines exhibit as much chlorophyll reduction and yield loss as do SSL-susceptible sister lines.

5. Functional genomic analysis of tomato plant response to whitefly feeding. **C. L. McKenzie**, X. H. Sinisterra, C. A. Powell, M. G. Bausher, J. P. Albano, and R. G. Shatters, Jr. USDA-ARS, U. S. Horticultural Research Laboratory, Fort Pierce, FL.

Gene array technology was applied to tomato as a model system to study gene expression over time in tomato plants subjected to a moderate infestation of whitefly and resulting in the development of TIR. Multiple plant harvests of old and young leaves, stems, roots, flowers and fruit from tomato with and without whitefly were processed for nutritional analysis and RNA extraction. RNA was labeled and hybridized to the gene array membrane to determine which genes SLW feeding influences. Plants infested with whitefly were larger, produced more leaves, flowers and fruit, but significantly less fruit ripened compared to plants without whitefly. Preliminary plant nutrition and RNA profiling results will be presented.

6. Whitefly (*Bemisia tabaci* B biotype) functional genomics: expressed sequence tag (EST) analysis of whitefly-begomovirus interactions. **R. G. Shatters, Jr.**, H. Czosnek, C. L. McKenzie, and J. K. Brown. USDA, ARS, U. S. Horticultural Research Laboratory, Fort Pierce, FL.

Random sequencing of cDNA clones generated from whole adult whitefly was performed to develop Expressed Sequence Tag libraries. Libraries were constructed from adult whitefly feeding on healthy tomato, and tomato infected with either of two economically important begomoviruses: Tomato yellow leaf curl virus (TYLCV) or Tomato mottle virus (ToMoV). Differences in abundance of transcripts among the three libraries are being evaluated to identify how the plant begomoviruses, that are vectored by the whitefly, influence whitefly biology.

7. Differential transcriptional activity of plant pathogenic Begomoviruses in their whitefly vector, *Bemisia tabaci* Gennadius (Hemiptera: Aleyrodidae). **Xiomara H. Sinisterra**, C. L. McKenzie, W. B. Hunter, and R. G. Shatters, Jr. USDA, ARS, U.S. Horticultural Research Laboratory, Fort Pierce, FL.

The genetic activity of two begomoviruses in their whitefly vector was studied using real-time reverse transcriptase-PCR (RRT-PCR). Three gene transcripts from *Tomato mottle virus* (AV1, BC1, BV1), and *Tomato yellow leaf curl virus* (V1, V2, and C3) were quantified in whiteflies: 1) after feeding on infected tomato plants, and 2) after subsequent transfer to cotton (a non-viral host). ToMoV gene transcripts were undetectable in whiteflies transferred to cotton, while, TYLCV transcripts increased in whiteflies transferred to cotton. Plant viral transcriptional activity within the insect vector was associated with lower viral DNA titer in the plant and changes in viral DNA accumulation patterns within the whitefly.

8. Flower thrips dispersion and oviposition behavior in blueberry fields of Florida and southern Georgia. **H. Alejandro Arévalo** and Oscar E. Liburd. Entomology and Nematology Department, University of Florida, Gainesville, FL.

Flower thrips are considered one of the most common pests during the blueberry blooming season. A series of experiments were conducted in Florida, and southern Georgia to analyze thrips behavior, and dispersion under field conditions. Results indicate that thrips prefer to oviposit in petals rather than other floral tissues. Also, thrips population increase rapidly followed by a quick reduction, which is correlated with the petal fall and independent of environmental factors including rain and temperature.

9. Age and light: effects of age of the house fly *Musca domestica* on its attraction to light traps. **Matthew Aubuchon.** University of Florida, Entomology and Nematology Department, Gainesville, FL.

The objective of this study is to determine the effects of house fly age on light-trap catch in urban environments. House fly pupae were reared to adulthood, then segregated into the following ages: one day, three days, five days, and seven days. One hundred house flies from each age group were released for four hours inside an enclosed bioassay containing an ultraviolet light trap.

10. Influence of male pheromones on sexual maturation in female Caribbean fruit fly. **Rui Pereira**. USDA, ARS, CMAVE, Gainesville, FL.

The presence of males affects female ovarian development of *Anastrepha suspensa* (Loew). The results found that: (1)

laboratory strains and wild strains have different female maturation rates regardless of male presence; (2) male presence accelerated maturation in wild females and to a lesser extent semi-wild flies recently adapted to laboratory conditions, but had no effect on the long domesticated strain; (3) the visual presence of males did not influence female maturation.

11. Pesticide compatibility and alternative flushing methods for monitoring nematode-infected mole crickets. **Kathryn A. Barbara** and Eileen A. Buss. University of Florida, Department of Entomology and Nematology, Gainesville, FL.

Mole crickets (*Scapteriscus* spp.) are the most damaging insect pests of managed turfgrass and pastures in the southeastern United States. Although insecticides often provide effective short-term control, greater long-term suppression of mole crickets using natural enemies, such as *Steinernema scapterisci*, is needed. Mole cricket populations are currently monitored using soap flushes, however soap may kill these nematodes and produce false negatives when determining the percentage of mole crickets infected. We evaluated the effect of several alternative flushing solutions on nematode survival and infectivity, as well as their effectiveness in flushing mole crickets in the field. We also examined the compatibility of several common mole cricket pesticides with *S. scapterisci*.

12. The toxicity of fatty acid salts to cockroaches. **Rebecca Baldwin** and Philip G. Koehler. University of Florida, Department of Entomology and Nematology, Gainesville, FL.

A bioassay was conducted to determine the toxicity of fatty acid salts to German cockroaches, *Blattella germanica* and American cockroaches, *Periplaneta americana.* Sodium and potassium fatty acid salts with carbon chains ranging from 8 to 18 were tested according to solubility. Effective dose was determined for each fatty acid for both species utilizing a dip application.

13. Effects of living and synthetic mulches on the population dynamics of homopteran pests, their associated natural enemies, and insect transmitted diseases. **Daniel L. Frank** and Oscar E. Liburd. Entomology and Nematology Department, University of Florida, Gainesville, FL.

Cultural control of pests using mulches has shown success in reducing the population density of aphids and whiteflies, while delaying the onset and spread of associated insect-borne diseases in zucchini. Our results show that reflective and buckwheat mulches consistently had lower incidence of adult whiteflies, aphids, and viral diseases compared with other mulch treatments evaluated. In addition, living mulch treatments consistently had higher natural enemy populations than the synthetic mulch and bare ground treatments.

14. Evaluation of predatory mites and reduced-risk miticide for control of twospotted spider mites in north-central Florida. **Elena M. Rhodes** and Oscar E. Liburd. Entomology and Nematology Department, University of Florida, Gainesville, FL.

Laboratory and field experiments were conducted during 2003 and 2004 to determine the effectiveness of 2 predatory mite species and Acramite 50WP, for control of twospotted spider mite (TSSM) (*Tetranychus urticae* Koch) in Florida strawberry fields. In field studies *Neoseiulus californicus* significantly reduced populations of TSSM below numbers recorded in untreated and *Phytoseiulus persimilis* plots. Acramite was also effective in reducing TSSM populations. Similar trends were seen in laboratory experiments.

15. Monitoring and control tactics of grape root borer (GRB) in Florida vineyards. **Scott Weihman** and Oscar E. Liburd. Entomology and Nematology Department, University of Florida, Gainesville, FL.

Sixteen Florida vineyards were selected to compare pheromone-winged and bucket traps for monitoring grape root borer (GRB) *Vitacea polistiformis* (Harris). In addition, we compared mating disruption techniques using pheromone twist-ties extracted from the Leopard Moth, *Zeuzera pyrina* L., attract-and-kill gels with GRB pheromone and pyrethrum, and Lorsban for control of GRB. Bucket traps performed better than winged traps and complete trap shutdown was obtained using pheromone twist-ties, which performed better than other treatments evaluated.

16. An overview of the current weed biocontrol projects in the USDA/ARS South American Biological Control Laboratory (SABCL). **Willie Cabrera Walsh**. USDA/ARS/SABCL, Argentina.

17. Effect of experimental field releases of the thrips *Pseudophilothrips ichini* (Thysanoptera: Phlaeothripidae) on the growth of Brazilian peppertree, *Schinus terebinthifolius*, in Southeastern Brazil. **Jim Cuda** and J.H. Pedrosa Macedo. University of Florida, Gainesville, FL.

18. Origin of the Florida population of *Dioscorea bulbifera* (air potato) and initial foreign exploration for potential biological control agents. **Bill Overholt** and C. R. Hughes. University of Florida, Ft Pierce, FL.

Identification of the geographic origin of an introduced weed is one of the first steps in a classical biological control program. The native range of *Dioscorea bulbifera* (air potato) spans a vast area of the Old World from West Africa to eastern Asia. The source of the air potato that was introduced into the United States is unknown. Previously published studies on maternally-inherited chloroplast DNA of air potato indicated a deep phylogenetic split between African and Asian samples. We examined chloroplast DNA from Florida air potato, and matched the restriction fragment pattern to the published patterns. The pattern matched samples from Africa, providing clear evidence of an Africa origin. Sequencing of four phylogentically conserved regions of DNA showed that Florida plants had extremely low diversity, strongly suggestive of a single introduction. Based on the finding of an African origin, visits trips have been made to Uganda in East Africa and Ghana in West Africa to collect air potato samples for genetic comparison to Florida material, and to begin searching for potential biological control agents. Several insect herbivores of air potato have been collected and identified, and a few of these were found feeding on aerial bulbils. The discovery of bulbil feeding insects is encouraging in terms of host specificity, as only exotic *Dioscorea* spp. in Florida have these structures.

19. A case study using molecular phylogeny as a tool for assessing host specificity of a biological control agent: the *Fergusobina/Fergusobia* complex on *Melaleuca quinquenervia.* **Rob Giblin-Davis**. University of Florida, Ft Lauderdale, FL.

20. Maintenance of a narrow host range by *Oxyops vitiosa*, a biocontrol agent of the environmental weed *Melaleuca quinquenervia.* **Greg Wheeler**. USDA/ARS, Invasive Plant Research Lab, Ft. Lauderdale, FL.

Host range expansion in insect herbivores is often thought to be mediated by several factors, principal among them are secondary plant metabolites. In weed biological control, the host range of a prospective new agent is one of the most important considerations in the development of control agents. A host testing process seeks to determine the behavioral acceptance and nutritional value of different test plant species to the potential agent. The host testing of the *Melaleuca quinquenervia* biological control agent *Oxyops vitiosa* indicated that larvae would accept and complete development on the Australian target weed *M. quinquenervia*, two Australian ornamental species, *Callistemon citrina*, *C. viminalis* (Myrtaceae). However, the larvae did not complete development when fed a North American species *Myrica cerifera* (Myricaceae). The study reported here confirms these results and examines the nutritional and performance differences in *O. vitiosa* larvae fed leaves of these species. The results indicate that plant quality among the Mytaceae species was generally similar and correspondingly larval survival, performance and digestive indices differed little when larvae were fed leaves of these species. However, significant differences occurred in the plant quality of the North American M. cerifera compared with the Australian species which had leaves with the lowest percent moisture, lowest leaf toughness, highest percent nitrogen. This species, however, is not a physiological host as none of the neonates survived to pupate. The marginal acceptance of this North American native plant in laboratory bioassays appears related to the terpenoid chemistry that has similarities to the taxonomically unrelated host M. quinquenervia. However, the high larval mortality corresponds to several novel terpenoids that are not present in the host. For weed biological control host testing these results indicate that M. cerifera is a poor host for O. vitiosa. Additionally, future test plant lists should include plants with secondary metabolites similar to the target weed as these compounds may constitute behavioral cues that are relevant to these specialized herbivores.

21. Resource allocation and compensation for herbivory by *Melaleuca quinquenervia*, an invasive tree in South Florida. **Paul Pratt**. USDA/ARS, Invasive Plant Research Lab, Ft Lauderdale, FL.

Situations when plants overcompensate for effects of herbivory are often correlated with favorable growing conditions, limited competition and minimal top-down regulation. These conditions are characteristic of many wetlands dominated by introduced plants, suggesting that exotic, invasive weeds in these systems should demonstrate strong compensatory abilities. We tested the hypothesis that limited folivory by *Oxyops vitiosa* reduces reproductive performance of the introduced tree *Melaleuca quinquenervia* (under compensation hypothesis). Trees experiencing folivory over four consecutive years possessed similar levels of foliar biomass after attack yet twice the number of leaf bearing terminal stems as undamaged trees. The biomass of these stems was similar among treatments, demonstrating that herbivore damaged trees produce greater quantities of smaller terminal branches. However, these individuals were 36 times less likely to reproduce than undamaged trees. Similarly, 54% fewer fruits were developed from the few flowers produced on damaged trees as compared to those arising from undamaged trees. From these data we conclude the *M. quinquenervia* partially compensates for herbivory by producing new stems and replacing foliage, but this compensation comes at a significant cost to fitness.

22. Biological control and herbivory resistance in the invasive tree *Melaleuca quinquenervia.* **Steve Franks**, P. D. Pratt, F. A. Dray, and E. L. Simms. Invasive Plant Research Lab, USDA/ARS Ft Lauderdale, FL.

One potential concern of biological control efforts is that plants may evolve resistance to the effects of the agents, reducing the long-term efficacy of biocontrol. We conducted a quantitative genetics field experiment using seedlings of the invasive tree Melaleuca quinquenervia to determine 1) if genotypes from the introduced range were preferred and suffered greater herbivore damage than genotypes from the home range, 2) if genotypes from the introduced range grew taller than native range genotypes in the absence of insects, and 3) if resistance to herbivory in the introduced range

would be expected to increase over time in the presence of insects. We collected seeds from 120 maternal trees: 60 in Florida (introduced range) and 60 in Australia (native range). Seedlings from these trees were planted in the field and were either subjected to natural levels of herbivory by biological control and native insects or were protected from herbivory using insecticides. Genotypes from the introduced range had a greater proportion of insects than genotypes from the native range, supporting the evolution of decreased defense allocation hypothesis, but were not more damaged. Genotypes from the introduced range were not taller than genotypes from the native range in either the sprayed or unsprayed treatment, which does not support the evolution of increased competitive ability hypothesis. Plants from the introduced range had a lower density of leaf hairs, and leaf hairs were correlated with the presence and damage of insects. Leaf pubescence also appears to be heritable and under directional or possibly stabilizing selection, but the pattern of selection did not depend on effects by the insects. The results of the study generally support the natural enemy release hypothesis, but do not indicate that the evolution of increased herbivore resistance will pose a substantial threat to biological control efforts.

23. Effects of temperature, relative humidity, and chemotype on the biology and life table parameters of *Boreioglycaspis melaleuca* Moore, a biological control agent of the invasive weed, *Melaleuca quinquenervia* (Cav.) S. T. Blake. **Robyn Chiarelli.** USDA/ARS Invasive Plant Research Lab, Ft Lauderdale, FL.

24. Comparative effects of the waterhyacinth weevils *Neochetina eichhorniae* and *N. bruchi* on competition between waterhyacinth (*Eichhorniae crassipes*) and waterlettuce (*Pistia stratiotes*). **Ted Center**, Thai K. Van, Teresa Rebelo, F. Allen Dray, Paul Pratt, and Min B. Rayamahji. USDA/ARS, Invasive Plant Research Lab, Ft Lauderdale, FL.

Two factors are of concern when considering a new biological control agent: safety and ability to control the weed. Methods for evaluating safety are well known but scant attention has been given to assessment of the candidate's potential value. This is understandable inasmuch as the agent's performance depends on the role of regulating factors that differ between donor and recipient regions. Also, important subtle effects of seemingly benign biological control agents are not easily discerned. These, however, can become apparent when the targeted plant is subjected to other stresses, like interspecific competition. Additive series analysis (inverse linear models) of competition between the weed and a competitor as mediated by the prospective agent has been proposed for judging the value of new agents. We examined this possibility by comparing the abilities of two congeneric waterhyacinth weevils, *Neochetina eichhorniae* and *N. bruchi*, to modify competition between waterhyacinth and waterlettuce. The competition analysis revealed that, without weevils, 41 waterlettuce plants were required to produce an effect equivalent to a single waterhyacinth plant on waterhyacinth yield, i.e., intraspecific competition was 41 times stronger than interspecific competition. Exposure to weevils reduced the intraspecific to interspecific competition ratio to near unity, indicating parity between the competing species. Nonetheless, *N. bruchi* was more effective than *N. eichhorniae*, and the two combined was only slightly better than *N. bruchi* alone. Similar results were obtained with ramets or flowers as yield components. Nutrient limitation didn't alter relative results, although all yield components were reduced in lower nutrient environments. We conclude that important effects of these weevils act through modification of water hyacinth competitive ability. This approach could allow assessment of the value of proposed introductions by preempting the release of risky agents with little control value, while increasing the valuation of those that cause seemingly trivial damage.

25. Ecology of common salvinia, *Salvinia minima*, in South Florida. **Phil Tipping**. USDA/ARS, Invasive Plant Research Lab, Ft Lauderdale, FL.

26. Withdrawn

27. Pathways for introduction of Caribbean insects into Florida. **Fernando E. Lenis**. USDA, APHIS, PPQ.

28. Termites (Isoptera) and ants (Hymenoptera: Formicidae) of the Caribbean. **Rudolf H. Scheffrahn**. University of Florida, Ft. Lauderdale, FL.

29. Stinkbug (Hemiptera: Pentatomidae) pests in the Caribbean. **Joe Eger**. Dow Chemical Co.

30. Agriculturally important weevils (Coleoptera: Curculionidae) of the West Indies. **C. W. O'Brien**. Florida A&M University, Tallahassee, FL.

31. Is the Caribbean a pathway for introduction of exotic psyllids (Hemiptera: Psyllidae) into Florida? **Susan Halbert**. Florida Department of Agriculture & Consumer Services, Gainesville, FL.

32. *Oxycarenus hyalinipennis* (Hemiptera) and other pest lygaeids of the Caribbean. **Julieta Brambila**. Florida Department of Agriculture & Consumer Services, Gainesville, FL, and Thomas T. Dobbs, USDA-APHIS-PPQ, Miami, FL.

Oxycarenus hyalinipennis (Costa) (Heteroptera: Oxycarenidae), an important pest of cotton, has been intercepted numerous times at U.S. ports of entry. This Old world species has been introduced into the Western Hemisphere, and occurs in the Caribbean, but is not reported from North America. *Dieuches armatipes* Walker (Heteroptera: Rhyparochromidae), a pest of the harvested peanut that has also been introduced into the Caribbean, has established in

Florida.

33. Mole crickets of the Caribbean. **J. H. Frank**. University of Florida, Gainesville, FL.

34. Effect of the immigrant weevil *Metamasius callizona* (Chevrolat) on the mortality of native bromeliads in Myakka River State Park, Sarasota County, Florida. **Teresa Cooper**. Entomology and Nematology Department, University of Florida, Gainesville, FL.

An immigrant bromeliad-eating weevil, *Metamasius callizona* (Chevrolat), has been decimating native bromeliad populations in south Florida. A study on a population of bromeliads in Myakka River State Park is estimating the degree of damage the weevil is inflicting. A comparison is made between the degree of mortality caused by the weevil relative to mortality caused by other forces. Mortality caused by the weevil is also related to bromeliad size, species and location.

35. Indoxacarb toxicity to American and German roaches. **Linda NcHerne**. University of Florida, Gainesville, FL.

Baits are a primary method of controlling cockroaches in structures. Indoxacarb, a novel oxadiazine insecticide was evaluated as an oral toxicant for German cockroaches, *Blattella germanica*, and American cockroaches, *Periplaneta americana*. Choice tests were performed with varying strengths of indoxacarb gel bait to evaluate mortality of German and American cockroaches, These baits were tested against standard baits containing fipronil, hydramethylnon, abamectin, and imidacloprid.

36. Contamination of water in pipes by volatile organic compounds. **Justin Saunders** and Philip G. Koehler. University of Florida, Department of Entomology and Nematology, Gainesville, FL.

Residual soil termiticides are directly applied to soil surrounding PVC, CPVC, and PEX water supply lines. Solvents in these termiticides have been demonstrated to degrade water supply lines. This leads to concerns of water contamination by solvents in termiticide formulations. The objective of this study was to determine concentrations of volatile organic compounds in water within treated pipe as a result of termiticide application.

37. Withdrawn

38. Fungal pathogens of the glassy-winged sharpshooter. **Samuel E. Breaux**, Drion G. Boucias, and Russell F. Mizell, III. University of Florida, NFREC-Quincy, Quincy, FL 32351.

The glassy-winged sharpshooter, *Homalodisca coagulata*, is an efficient vector of the bacterium *Xylella fastidiosa*, which is responsible for a variety of plant diseases of economic importance. Native to the Southeastern U.S., *H. coagulata* was found in California in the late 1980's and has since established itself in great numbers. Recently, three new species of fungal pathogens of the GWSS were discovered in Florida. I.D., phylogeny, epidemiology, and pathogen dynamics within the leafhopper population will be discussed.

39. Genetic/genomic dissection of how male fruit flies modulate the reproductive biology of their mates. **Mariana Federica Wolfner**. Dept. of Molecular Biology and Genetics, Cornell University, Ithaca NY.

Mating causes dramatic changes in the physiology and behavior of female insects, initiating or increasing egg production, facilitating sperm storage, and modifying females' responses to subsequent mating. Genetic, genomic and transgenic approaches have shown that seminal proteins and sperm trigger these changes in Drosophila. This talk will describe the nature, activities and interesting evolutionary dynamics of male-provided inducers of post-mating changes in Drosophila females, and the genetic/molecular responses by these female.

40. Phylogenetic relationships of *Anastrepha suspensa* (Caribbean Fruit Fly) from Florida inferred from mitochondrial DNA sequence data. **Laura Boykin**, Robert Shatters, David Hall, Ken Hibbard, and Ann Fritz. USDA-ARS, U. S. Horticultural Research Laboratory, Fort Pierce, FL.

A phylogenetic study of *A. suspensa* in Florida has been initiated to provide information on genetic diversity of *A. suspensa* populations. A mitochondrial genome sequence comparison strategy will be used to compare mitochondrial Cytochrome Oxidase I, II, and III sequences. These regions were chosen based on published studies demonstrating their utility in detection of genetic diversity within populations of Drosophila. Phylogenetic relationships inferred from maximum likelihood and Bayesian analyses of *A. suspensa* will be presented.

41. Molecular biology and population genetics. **Mike Caprio**. Insect Genetics, Dept. of Entomology, Mississippi State University, Mississippi State, MS.

Population genetics is the understanding of how and why gene frequencies vary between populations. As such, it bridges the gap between Mendelian genetics and evolution. The emphasis in population genetics has been to utilize many, preferably neutral, genetic markers. The trend in the last 40 years has been towards techniques that increasingly reveal genetic variability among individuals and populations, and the field has been revolutionized by relatively easy

access to this genetic variation.

42. The use of RNAi in the suppression of a member of the calcium dependent protein kinase gene CDPK9: a specfic member of a unique family of enzymes. **Catherine S. Katsar.** Department of Plant Pathology, Iowa State University, Ames, IA.

CDPK9 is a member of a conserved gene family representing a number of calcium-dependent protein kinases. CDPK9 has been shown to be involved in signal transduction pathways, and *Arabidopsis thaliana* plant defenses against the sugarbeet cyst nematode, *Heterodera schachtii*, upon infection. Similar to gene silencing, RNA interference or RNAi is a method that facilitates the suppressions of gene function and has been employed to suppress the function of the CDPK9 gene from *A. thaliana* in an effort to determine its effect on resistance to the sugarbeet cyst nematode.

43. Potential uses of insect viruses to manage leafhopper vectors of Pierce's Disease. **Wayne Hunter**. USDA-ARS, U.S. Horticultural Research Laboratory, Fort Pierce, FL.

New developments in molecular biology and virology have opened the use of insect viruses as molecular tools to examine gene functions, and as potential biological control agents for use as the 'next generation' of insect management strategies. The use, application, and concerns of some of these strategies will be presented.

44. Vitellogenin of the glassy-winged sharpshooter. **Laura E. Hunnicutt** and Wayne Hunter. USDA-ARS, U. S. Horticultural Research Laboratory, Fort Pierce, FL.

The glassy-winged sharpshooter is the primary vector of the bacterial pathogen *Xylella fastidiosa* which has been indicated as the causal agent of numerous diseases of economic importance including Pierce's Disease of grapes and Citrus Variegated Chlorosis. In order to develop new methods of combating this pest, we have begun to examine many of the genes related to reproduction and egg development. Herein, we discuss the identification of a vitellogenin protein-coding domain as well as its potential applications for insect management.

45. Effects of herbivory by a xylem-feeding leafhopper, *Homalodisca coagulata*, on the vascular transcriptome of *Citrus sinensis*. **Jerry Mozoruk**, Laura Hunnicutt, Ronald Cave, Michael Bausher and Wayne Hunter. USDA-ARS, U.S. Horticultural Research Laboratory, Fort Pierce, FL.

The glassy-winged sharpshooter (GWSS) has generated significant attention as a major pest due to its ability to vector the bacterial pathogen *Xylella fastidiosa*. Despite the economic impact of this association, research has been limited regarding the molecular nature of plant defense response to xylem-feeding pests. In this investigation, we used cDNA array analysis of GWSS-infested citrus to better understand the genetic response profile elicited during this method of insect feeding.

46. Termidor and Phantom research and labeling update. **Bob Hickman**. BASF, Orlando, FL

47. Current research in Syngenta professional products: a Vero Beach, Florida perspective. **Clark Lovelady**. Syngenta, Vero Beach, FL.

48. From earth to air - control of structure-infesting pest USDA-ARS, U.S. Horticultural Research Laboratory, Fort Pierce, FL.s with new technologies from Dow AgroSciences. **Ellen Thoms**, and Joe Eger. Dow AgroSciences, Gainesville, FL.

This presentation will review the utility of new technologies related to the control of subterranean termites and stored product pests. New technologies recently developed to improve the SentriconÒ Termite Colony Elimination System include Electronic Sensing ProtectionÔ (ESP), a new active ingredient (noviflumuron), and Preferred Textured Cellulose, an improved bait matrix. The development and recent EPA registration of ProFumeÒ gas fumigant (sulfuryl fluoride) for control of stored product insects infesting dried fruit and tree nuts and cereal grains will be discussed.

49. Research and development update from Bayer Environmental Science. **John Paige III.** Bayer Environmental Science, Vero Beach, FL.

Laboratory and field based development efforts for 2004 are aimed at subterranean and drywood termites, German cockroaches, houseflies and various species of ants. Non-traditional termite treatment practices were evaluated over the past several years and the efficacy and practicality of such practices will be discussed.

50. PeradigmT: a novel treatment for the control of turf, greenhouse, and general household pests. **Dina Richman** and Bruce Ryser. FMC Corporation, Philadelphia, PA.

FMC Specialty Products Business is evaluating a new, novel, non-residua treatment for the control of turf, greenhouse, and general household pests. On turf, Peradigm can be used as an algicide and disinfectant. In nurseries and greenhouses, Peradigm disinfects pots, equipment, surfaces, and irrigation systems. For general household pests, Peradigm destroys the breeding site and food sources used by filth-breeding flies, such as moth and fruit flies. Efficacy data generated from lab and field trials will be presented and discussed.

51. New source of southern chinch bug resistance in a diploid selection of St. Augustinegrass. **Ron Cherry** and Russell Nagata. Everglades Res. & Ed. Ctr., 3200 E. Palm Beach Rd., Belle Glade, FL 33430

Tests showed a high level of southern chinch bug resistance in NUF-76. NUF-76 is unique because for the first time, resistance to the southern chinch bug has been identified within a diploid line of St. Augustinegrass. This discovery will allow chinch bug resistance to be more easily bred into other St. Augustinegrass lines.

52. Gliding flight in neotropical arboreal ants. **Stephen P. Yanoviak.** University of Florida Medical Entomology Lab, Vero Beach, FL.

Workers of the neotropical ant *Cephalotes atratus* exhibit nonrandom gliding flight when dislodged from tree branches. Falling ants glide abdomen-first through a J-shaped trajectory back to the tree trunk with >80% consistency. This frequency is unaffected by familiarity with the tree, position of the ant or the branch relative to the trunk, or horizontal distance from the trunk. Other arboreal ant taxa also glide, but the behavior is best developed in the tribe Cephalotini.

53. Mobility of the silky cane weevil (Coleoptera: Curculionidae) in a screen enclosure. **Helena Puche**, T. J. Weissling, R. Schnell, N. D. Epsky, and R. R. Heath. Subtropical Horticulture Research Station, USDA-ARS, Miami, FL.

The rate of dispersal of the silky cane weevil (SCW) *Metamasius hemipterus sericeus* (Olivier), was studied using a passive diffusion model. After releasing 100 SCW in a screen house, weevils slowly moved away from the release point over time. Dispersal rates, D and disappearance rates, m, between rows were significantly higher 1-8 h after release. Rows of buckets at sunny sides of the array had higher weevil captures. This baseline information could be used in control treatments of SCW.

54. Asian ambrosia beetle: biology, behavior and management tools. **Russell F. Mizell, III** and T. Charles Riddle. University of Florida, NFREC-Quincy, Quincy, FL.

The Asian ambrosia beetle, *Xylosandrus crassiusculus*, arrived in the U.S. from southeast Asia in the early 1970's and was first detected in South Carolina. It became a serious pest of Florida nursery stock in the late 1980's. Since then it has spread from Maryland to Texas. This beetle attacks trees such as Bradford pear, Drake elm, oaks, pecan, chestnut and Kwanzan cherry. The beetles behavior and chemical tools for its control will be discussed.

55. Oviposition and isolation of viable eggs from *Orius insidiosus* in a Parafilm® and water substrate. **Jeffrey P. Shapiro** and Stephen M. Ferkovich. USDA, ARS, CMAVE, Gainesville, FL.

To isolate clean intact eggs for use as protein standards in a yolk protein ELISA, an oviposition substrate for *O. insidiosus* was devised by forming water-filled domes from Parafilm®. Eggs deposited in substrates remained viable for at least 24 he. In no-choice tests, *O. insidiosus* females oviposited 5.86 eggs/female/day into green beans and 3.06 into water-domes. In a choice test, *O. insidiosus* females clearly preferred beans to domes (4.02 vs. 0.03 eggs/female/18 hr).

56. Effect of sample size on the accuracy and precision of citrus rust mite density estimates on citrus fruit. **David G. Hall**, Carl C. Childers, and Joseph E. Eger. USDA, ARS, U.S. Horticultural Research Laboratory, Fort Pierce, FL.

Consequences of reducing sample size on the accuracy and precision of estimates of citrus rust mite densities on oranges were investigated. The sample unit was a 1-cm2 surface area on fruit. Sampling plans consisting of 360, 300, 200, 160, 80, 36 or 20 samples per 4 ha were evaluated through computer simulations using a dataset of real count data from 600 sample units per 4 ha. The results of the research provide guidelines for selecting a sampling plan.

57. Mating behavior and male reproductive success in the beetle, *Diaprepes abbreviatus.* **Laura K. Sirot**, H. Jane Brockmann, and Stephen L. Lapointe. Department of Zoology, University of Florida, Gainesville, FL.

We examined the relationship between male traits and reproductive success after mating has begun in the beetle *Diaprepes abbreviatus.* The second male to mate fertilized a greater proportion of the eggs laid by his mate than the first male. Mating duration and the relative rate at which the male stroked the female both positively related to the proportion of eggs he fertilized. Male size and male thrusting rate were not related to reproductive success.

58. Development of rearing methods and a synthetic female sex pheromone for the pink hibiscus mealybug. **Stephen L. Lapointe** and D. G. Hall. USDA, ARS, U.S. Horticultural Research Laboratory, Fort Pierce, FL.

The appearance of the pink hibiscus mealybug, *Maconellicoccus hirsutus* (Green), in the Caribbean in the early 1990's stimulated collaborative research to develop efficient rearing methods, mass production of natural enemies, and identification of sex pheromones for this species. We describe optimal rearing methods, aspects of the biology of *M. hirsutus*, and the elucidation of a binary female sex pheromone. Initial results from the first field deployment of pheromone-baited traps will be presented.

59. The impact of the European honey bee on an Australian native bee. **Dean Paini** and Dale Roberts. University of Florida (NFREC), Quincy, FL.

In Australia, the European honey bee represents a potential source of competition for native bees. The fecundity of a native bee (*Hylaeus alcyoneus*) was measured in response to honey bees. At treatment sites the number of nests produced by *H. alcyoneus* was 23% less (Wilcoxon's T) than control sites. This result highlights that even though honey bees have been present in certain areas for many years, competition with native bees may still be occurring.

60. Population dynamics of fall armyworm in Florida. **Rod N. Nagoshi** and Robert L. Meagher. USDA, ARS, CMAVE, Gainesville, FL.

Spodoptera frugiperda (J.E. Smith) overwinters in southern Florida before migrating into the eastern U.S. We used strain-specific molecular markers to examine seasonal changes in population numbers in different Florida habitats and discuss possible relationship with migration behavior.

61. Scale insects: an overview of taxonomy and importance. **Michael Williams**. Auburn University, Department of Entomology and Plant Pathology, Auburn, AL.

A brief overview of the history of the study of scale insects, emphasizing some of the challenging problems presented by these insects that do not look like insects, have bizarre life histories and exhibit unusual characteristics and habits. Learn about such things as blind marriages, hermaphroditism, simultaneous multiple mating, and taxonomic nightmares!

62. *Duplachionaspis divergens*: a little known invasive armored scale on Florida's grasses. **Greg Hodges**. Florida Department of Agriculture & Consumer Services, Division of Plant Industry, Gainesville, FL.

Duplachionaspis divergens (Diaspididae), an exotic armored scale insect introduced into Florida is restricted to grass hosts. It is a pest of sugarcane in Colombia and India. In Florida it has also been found on St. Augustine grass and many native grasses. The overall economic importance of this scale is unknown at the time but warrants close observation.

63. *Palmicultor* spp. (Pseudococcidae) in Florida. **Amanda Hodges**. Department of Entomology and Nematology, University of Florida, Gainesville, FL.

Three species of *Palmicultor* have been introduced into Florida in the last 10 years. Both *Palmicultor browni* and *P. palmarum* are considered pests of palms and *P. lumpurensis* is considered a pest of bamboo. The economic impact of these three species could be significant with both palms and bamboos being popular ornamental plants

64. Management of the cycad aulacaspis scale. **Catharine Mannion**. University of Florida, Tropical Research & Education Center, Homestead, FL.

Several insecticides were evaluated for control of cycad Aulacaspis scale as soil and/or drench applications. Recommendations on how to manage this pest in the landscape and nursery are discussed.

65. Biocontrol of cycad aulacaspis scale. **Ronald D. Cave**. University of Florida, Indian River Research & Education Center, Ft. Pierce, FL.

The predators and parasitoid of the cycad aulacaspis scale, *Aulacaspis yasumatsui*, in Florida are reviewed and new efforts to find additional natural enemies in Asia are described. Results from a monitoring project in St. Lucie Co. and preliminary observations of experiments to induce mortality with entomopathogenic nematodes are discussed.

66. The use of scale insect honeydew of *Stigmacoccus garmilleri* (Margarodidae: Xylococcini) by birds in Mexico. **Heather A. Gamper** and Suzanne Koptur. Florida International University, Miami, FL.

A scale insect, *Stigmacoccus garmilleri*, (Margarodidae) is associated with oak trees (*Quercus* spp.) in highland forests (2000 m) of Chiconquiaco, Veracruz, Mexico. Though ants occur in low abundance and are occasionally found foraging on honeydew produced by the feeding stages of this margarodid, the honeydew is copious enough to provide nourishment for birds.

67. Bionomics of lobate lac scale, a recently introduced scale insect in Florida. **Bill Howard** and Bob Pemberton. University of Florida, Ft. Lauderdale Research & Education Center, Fort Lauderdale, FL.

The natural history and host plants of lobate lac scale (*Paratachardina lobata*) and efforts to develop biological control for this invasive pest in Florida will be discussed.

68. Varietal Susceptibility and spatial analysis of local distribution of the lobate lac scale. **Nancy D. Epsky**, Divina Amalin, Helena Puche, and Catharine M. Mannion. USDA, ARS, Subtropical Horticulture Research Station, Miami, USDA, APHIS, Miami, and University of Florida, Tropical Research & Education Center, Homestead, FL.

A variety of reported hosts of lobate lac scale (*Paratachardina lobata*) (Kerriidae) are present in the germplasm collection located at the USDA/ARS Subtropical Horticulture Research Station in Miami. Studies have been initiated to determine the spatial and temporal distribution of the scale population. Results of the first year of this study will be reported.

69. A survey of the distribution of lobate lac scale in Florida. **Yvette Ogle**. Cooperative Agricultural Pest Survey(CAPS), Florida Department of Agriculture and Consumer Services, Division of Plant Industry, Gainesville, FL.

This paper will give the results of two surveys of the distribution of the lobate lac scale *Paratachardina lobata lobata* (Kerriidae) in Florida. In 2003, the species was recorded in urban and wild areas from West Palm Beach to Homestead. In 2004 it was found on the Florida west coast on Sanibel Island, in the mid-Keys, and north to St. Lucie County.

70. Management of scale insects and mealybugs on ornamental plants: the homeowner's perspective. **Adrian Hunsberger**. University of Florida, Miami-Dade Cooperative Extension Service, Homestead, FL.

Few homeowners have sufficient knowledge of insect pests and plant diseases to manage them or to communicate effectively with pest control professionals. This is particularly true with reference to scale insects. For example, these unusual insects are often identified as fungi or other organisms, and thus ineffective treatments are applied in futile attempts to control them. A common sense approach is needed for developing better communication between homeowners and pest management professionals.

71. Life cycle and management of *Kermes* scale in Florida. **Jay Cee Turner** and Eileen Buss. University of Florida, Department of Entomology and Nematology, Gainesville, FL.

This paper reports life history and management of a Kermes scale (*Allokermes kingii*) on oaks (*Quercus* spp.) in Florida, including it's seasonal history and natural enemies. The results of an insecticide trial against the nymphs are reported.

72. Biology and management of the Madeira mealybug. **Juang-Horng Chong** and Ronald D. Oetting. Dept. of Entomology, University of Georgia, College of Agriculture and Environmental Sciences, Griffin, GA.

The Madeira mealybug is one of the most important mealybug pests in greenhouse ornamental production of the southeastern US. Females complete development within 30 days at 25°C and produce more than 300 eggs. Chemical control is the most effective management tactic against the Madeira mealybug. Biological control of this species will also be discussed.

73. The status of the pink mealybug in Florida. **Lance Osborne**. University of Florida, Mid-Florida Research and Education Center, Apopka, FL.

Information on the history of pink hibiscus mealybug infestation in Florida will be presented. The use of both biological and chemical controls to manage this pest and the current distribution will also be presented. The impact this pest has had on trade will also be discussed.

74. Cochineal rearing: the revival of an ancient technology in Mexico. **Liberato Portillo**. University of Guadalajara, Departamento de Botánica y Zoología, Guadalajara, Mexico.

Dactylopius spp. constitute a small family of scale insects, the Dactylopiidae, all species of which are found on cacti. Six out of ten species of *Dactylopius* occur in Mexico. The most important economically is *D. coccus,* due to its high content of carminic acid used as pigment. The culture of this insect as a source of this pigment is an ancient technology that is being revived in several countries.

75. Area-wide eradication program for the arboreal termite, *Nasutitermes costalis*, in southeastern Florida. **Rudolf H. Scheffrahn**, Steven Dwinell, Brian J. Cabrera, and William H. Kern, Jr. Fort Lauderdale Research and Education Center, University of Florida, Institute of Food and Agricultural Sciences, Fort Lauderdale, FL .

In May 2001, an exotic arboreal termite, *Nasutitermes costalis* was discovered in Dania Beach, Florida. In September 2002, a "Tree Termite Task Force" was convened to plan, implement, and verify the eradication of *N. costalis.* A survey of 80 hectares revealed 189 active sites over 16 hectares. In April 2003, Premise, 2, Termidor, SC, and Vikane, were applied on selected active sites. Limited retreatments with Termidor were conducted in September and December 2003. As of May 2004, only three active sites were detected and destroyed.

76. Reproductive diapause in the glassy-winged sharpshooter, *Homalodisca coagulata* (Say). **Christopher Tipping**, R. F. Mizell, III, and P. C. Andersen. University of Florida (NFREC), Quincy, FL 32351

The glassy-winged sharpshooter, *Homalodisca coagulata* (Say), is found throughout southeastern US and regions of California. It is thought to have 2 distinct generations per season. Adults over winter in a reproductive diapause that can be induced with a photoperiod of 13:10 L:D. In north Florida, this photoperiod occurs in early August. We propose that this relatively early reproductive diapause is a life-history response to predation pressure by *Gonatocerus spp*. egg parasitoids.

77. Evaluation of natural liquid and granular repellents for insect management on garden vegetables. **Michael L. Miller** and Susan E. Webb. University of Florida/ IFAS, Entomology and Nematology Department, Gainesville, FL.

Garlic-based repellents were tested on several garden vegetables. Treatments were applied at 7 to 14 day intervals and all insects were counted weekly. No serious insect damage occurred and beneficial insects were frequently observed in the field. Bean leaf roller was not as abundant on plants treated with repellent, but leafminers were more abundant.

78. Overview of the USDA-ARS Subtropical Insects Research Unit, Ft Pierce, Florida. **David G. Hall**, W. B. Hunter, S. L. Lapointe, C.L. McKenzie, R. Shatters, and A. A. Weathersbee. USDA, ARS, U.S. Horticultural Research Laboratory, Fort Pierce, FL.

The Subtropical Insects Research Unit (SIRU) was officially established by the USDA-ARS in 1972 and physically positioned with the U.S. Horticultural Research Laboratory in Orlando, Florida. This large laboratory was moved to new facilities in Ft Pierce during 2000. The Unit's original research mission was to reduce economic losses to invasive arthropod pests of citrus and later expanded to include pests of vegetables and ornamental plants. This presentation reviews current research activities by SIRU and provides an organizational overview of SIRU and other research units within ARS.

79. Ant predation and biological control of the root weevil, *Diaprepes abbreviatus*, in Florida citrus: field manipulations. **Robin J. Stuart**, Ian W. Jackson, and Clayton W. McCoy. University of Florida, Citrus Research and Education Center, Lake Alfred, FL.

The Diaprepes root weevil, *Diaprepes abbreviatus* (L.), is a major pest of Florida citrus. When neonate larvae hatch in the citrus canopy and drop to the soil surface before burrowing down to the roots for feeding, they are extremely vulnerable to ant predation. We manipulated ant populations in citrus groves using granular ant baits to determine the relationship between ant population levels (measured with baits) and predation pressure on neonates (measured by

exposing lab-reared neonates to field predation). Our results indicate a strong correlation between ant population levels and predation pressure, and reinforce the view that ants are important biological control agents of Diaprepes neonates.

80. Cyanogenesis in *Heliconius erato* (Nymphalidae: Heliconiinae) and *Passiflora* plants. **Mirian Medina Hay-Roe**. University of Florida, Entomology and Nematology Department, Gainesville, FL.

Two subspecies of *Heliconius erato* were fed different host plants (natural and alternative hosts) and then their growth trajectories, and cyanide concentrations were compared. Feeding on the most cyanogenic plant resulted in lower growth rates in both subspecies and higher mortality in *H. e. cyrbia*, but not in *H. e. favorinus*. The few *H. e. cyrbia* individuals that survived while feeding on the most toxic cyanogenic plant accumulated higher concentrations of cyanide in their bodies. *H. e. favorinus*, on the other hand, had lower concentrations of cyanide, even when fed the most toxic host plant.

81. Elucidating the gall-maker and natural enemy complex on containerized live oak trees. **Eileen Buss** and Lois Wood. University of Florida, Entomology and Nematology Department, Gainesville, FL.

Gall-makers are often aesthetic pests in landscapes, but are economic pests in Florida nurseries. Two stem-galling cynipids and a leaf-galling midge have been causing branch dieback and reducing sales of 3-300 gallon containerized live oak trees. Galls have been cut from trees every three weeks since March 2004, and inhabitants reared in the laboratory. The preliminary life histories of these gall-makers and possible effects of management practices on their populations will be discussed.

82. *Scirtothrips dorsalis* (Hood), a new threat to the greater Caribbean region. **D. R. Seal**, M. Ciomperlik, T. L. Skarlinsky, and W. Klassen. Tropical Research and Education Center, UF/IFAS, Homestead, FL.

Recently, *Scirtothrips dorsalis* was found widely distributed on St. Lucia and St. Vincent, West Indies. Various life stages of the pest were found on pepper, tomato, pumpkin, squash, cucumber, okra and ornamental plants. The pest caused severe scarring of pepper fruits, and was found on the leaves, flowers and fruits of this crop. The potential geographical distribution of *S. dorsalis* in North includes the entire Caribbean region, southern Florida and the continental United States to southern Canada.

83. Efficacy of Envidor™, a new acaricide from BayerCropscience, against Eriophyidae mites on Florida citrus. **Marco A. Toapanta**, John Bell, Joby Sherrod, Roy Morris, and Richard Rudolph. Bayer CropScience, Tampa, FL.

Envidor™ contains a novel acaricidal active ingredient, spirodiclofen, from the new chemical class of tetronic acids. This new contact acaricide is active against all developmental stages of Eriophyidae and Tetranychidae mites causing economic damage in Florida citrus through a new mode of action, inhibition of lipid biosynthesis. In field tests, Envidor, with and without horticultural spray oil, provided levels of efficacy similar to or greater than commercial standards in the marketplace. In addition, Envidor 2 SC applied with different water volumes and at different mite population densities resulted in excellent control and residual efficacy for more than 3 months compared to commercially available acaricides.

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