PROGRAM
&
PROCEEDINGS

of the

65th ANNUAL MEETING

of the **SOUTHWESTERN BRANCH** of the

ENTOMOLOGICAL SOCIETY OF AMERICA

and the **ANNUAL MEETING** of the

SOCIETY OF SOUTHWESTERN ENTOMOLOGISTS

April 9 - 13, 2017

Wyndham Garden Hotel Austin

Austin, Texas

SPONSORS

We thank the following people and organizations for their generous donations in support of Insect Expo and other functions of the SWB-ESA meeting.

PLATINUM

TRÉCÉ® INCORPORATED
Our Edge—And Yours—Is Knowledge

Entomology, Oklahoma State University, Plant Pathology

Entomological Society of America

A&M | ENTOMOLOGY
TEXAS A&M UNIVERSITY

West Texas A&M UNIVERSITY™

GOLD

OXFORD
UNIVERSITY PRESS

Polyguard®
Innovation based. Employee owned. Expect more.

ohp Partners with solutions

syngenta

SILVER

NICHINO
AMERICA®

STUDENT AWARDDS

Entomological Society of America
SOUTHWESTERN BRANCH

PERCIVAL

Society of Southwestern Entomologists
1976

SPONSORS 2

MEETING INFORMATION 4

PROGRAM INFORMATION 5

2015-2016 Executive Committee 5

2015-2016 Committees. 5

Past-Presidents & Chairmen of the Southwestern Branch 7

Plenary Session Schedule 8

Program Summary. 8

ORAL AND POSTER PRESENTATION SCHEDULE 11

Tuesday, April 11, Morning 11

Tuesday, April 11, Afternoon 11

Tuesday, April 11, Posters 15

Wednesday, April 12, Morning 17

Wednesday, April 12, Afternoon 20

Wednesday, April 12, Posters 22

ORAL ABSTRACTS, 1-1 — 11-9 24

POSTER ABSTRACTS, P1-1 — P4-22 47

INDICES 60

Author Index 60

Common Name Index 64

Scientific Name Index 65

WYNDHAM FLOOR PLAN 67

Meeting Information

REGISTRATION:

All persons attending the meetings or participating in the program must register. On-site registration fees for the meeting are:

Full meeting

Active ESA member	$200
Student ESA member	$90
Non-member	$250
Spouse/Guest	$50
Honorary/Emeritus	$60
One day registration	$100

The full-meeting fee includes admission to all functions, including the banquet.

HOTEL LOCATION:

The Wyndham Garden Hotel Austin is located at 3401 South IH-35, Austin, TX 78741
(512) 448-2444.

TRAVEL INFORMATION:

The Austin-Bergstrom International Airport is located at 700 Skyway Boulevard, Austin, TX, about 7 miles from the hotel. The Wyndham Garden Hotel offers a complimentary shuttle service for transport to and from the airport. To arrange a pick-up and drop-off, contact the Wyndham Garden Hotel at (512) 448-2444.

PROGRAM SCHEDULE AND MODERATORS:

Speakers are limited to the time indicated in the schedule, and moderators have the responsibility and authority to enforce restricting time to that in the schedule. Moderators should visit the Presentation Upload room to sign in before their assigned session and obtain speaker presentation files for the session. Moderators will upload all speaker files onto the A/V equipment in the meeting room.

AUDIOVISUAL & UPLOAD of PRESENTATIONS:

ONLY digital projectors with computers will be provided for oral presentations. Speakers must submit their presentations as Power Point files to the Upload / Presentation Preview Room one day before the session during which they will present. The Presentation Upload & Preview area will be located in the Blanco Room and will be open during the following hours:

Monday, April 10, 7:00 AM – 5:00 PM

Tuesday, April 11, 7:00 AM – 5:00 PM

POSTER PRESENTATION INFORMATION:

Poster Size: Poster must be contained within the 46 × 46 inch (117 × 117 cm) space provided. The poster must NOT exceed the size limit.

Set Up: Your poster must be displayed at your assigned space in the Lake Austin room the night before (i.e., either Monday or Tuesday, 6:00 – 8:00 PM) your poster is scheduled. **Bring your own Velcro strips or tacks to secure your display to the poster board.**

Author Presence: **All Student competitors are to stand next to their posters during designated BREAK time on Tuesday, April 11.** Regular member presenters should similarly be present at their posters during designated BREAK time on Wednesday, April 12.

ESA CERTIFICATION BOARD INFORMATION:

Information regarding the ESA Certification Board is available at the Registration Desk.

JOB OPPORTUNITY BOARD:

The Student Affairs Committee will host a Job Opportunities Board during the meeting. Employers are encouraged to post copies of available opportunities for prospective students. Prospective employees/students should bring multiple copies of CV or résumé to the Board for review by potential employers. Volunteers operating the Board will serve as liaisons to arrange interviews if needed.

LOST AND FOUND:

Articles should be turned in or reported to the Registration Desk or hotel main desk.

MESSAGES:

A message board is at the Registration Desk.

CODE OF CONDUCT

By attending the 2017 Southwestern Branch Annual Meeting, you agree voluntarily to abide by our ethics policy. The full policy may be found online at entsoc.org/conduct. If you need to file a complaint, please contact Rosina Romano at rromano@entsoc.org, (703) 593-0222.

Program Information

Entomological Society Of America Southwestern Branch

2016-2017 Executive Committee

Carlos Bográn, President
cbogran@ohp.com

Jerry Michels, Past-President
asychis@aol.com

Justin Talley, Vice President
justin.talley@okstate.edu

Eric Rebek, Secretary
eric.rebek@okstate.edu

Molly Keck, Secretary-elect
mekeck@ag.tamu.edu

Ed Bynum, Treasurer
ebynum@ag.tamu.edu

David Ragsdale, ESA Governing Board Representative
dragsdale@tamu.edu

2016-2017 COMMITTEES

AUDIT COMMITTEE
Scott Armstrong (Chair)
Matthew Lee
George Opit

AWARDS AND HONORS COMMITTEE
Jane Pierce (Chair)
Jesus Esquivel
Kristopher Giles
David Kattes
Alvaro Romero
Sonja Swiger
Justin Talley

BOARD CERTIFIED ENTOMOLOGIST
Molly Keck, BCE

BRANCH ARCHIVIST
Gregory Cronholm

FRIENDS OF THE SOUTHWESTERN BRANCH COMMITTEE
Jerry Michels (Chair)
Carlos Bográn
Jackie Lee
Scott Ludwig
Andrine Shufran

IN MEMORIAM COMMITTEE
Phillip G. Mulder, Jr. (Chair)
Edmond Bonjour
Jim Woolley

INSECT DETECTION, EVALUATION, AND PREDICTION COMMITTEE
Carol Sutherland (Chair)
Richard Grantham

INSECT EXPO COMMITTEE
Andrine Shufran (Chair)
Wizzie Brown
Molly Keck, BCE
Phillip G. Mulder, Jr.
Bonnie Pendleton
Jennifer Shaughney
Mo Way

INSECT PHOTO SALON COMMITTEE
Adrian Fisher (Chair)

LINNAEAN GAMES COMMITTEE
Scott Bundy (Chair)
Eric Rebek (Game master)
Cheri Abraham
Blake Bextine
Wyatt Hoback
David Kattes
Juliana Rangel Posada
Alvaro Romero
Bonnie Pendleton

LOCAL ARRANGEMENTS COMMITTEE
Wizzie Brown (Chair)
Molly Keck, BCE
Paul Nester

2016-2017 Committees ...continued

MEMBERSHIP COMMITTEE

Justin Talley (Chair)
Carlos Blanco
Manuel Campos
Rebecca Creamer
Jesus Esquivel
Juan Lopez
Bill Ree
Sergio Sanchez-Pena
Astri Wayadande

NOMINATING COMMITTEE

Jerry Michels (Chair)
Carlos Bogran
Bob Davis
Jesus Esquivel

PROGRAM COMMITTEE

Juliana Rangel Posada (Chair)
Laura Weiser Erlandson (Vice-Chair)

PUBLIC INFORMATION COMMITTEE

Carol Sutherland (Chair)
Tom Royer

SITE SELECTION COMMITTEE

Eric Rebek (Chair)
Carlos Bogran
Scott Bundy
Jerry Michels
Justin Talley

STUDENT AFFAIRS COMMITTEE

Carl Hjelmen (Chair)
Sudip Gaire
Philip Osei Hinson
Tanner Jenkins
Hame Kadi Kadi
Chris Powell

STUDENT RESEARCH PAPER AND POSTER AWARDS COMMITTEE

Bonnie Pendleton (Chair)
Ali A. Zarrabi
Blake Bextine
Robert Bowling
Scott Bundy
David Kattes
Jerry Michels
Jane Pierce
Eric Rebek
Tom Royer
Justin Talley

YOUTH SCIENCE COMMITTEE

Mo Way (Chair)
Wizzie Brown
Molly Keck, BCE
Bonnie Pendleton
Jane Pierce
Andrine Shufran

Past-Presidents and Chairmen of the Southwestern Branch

President	Year	Meeting Location
Jerry Michels	2015-16	Tyler, TX
Bob Davis	2014-15	Tulsa (Catoosa), OK
Jesus Esquivel	2013-14	San Antonio, TX
Scott Bundy	2012-13	Las Cruces, NM
Allen Knutson	2011-12	Little Rock, AR
Tom Royer	2010-11	Amarillo, TX
Carlos Blanco	2009-10	Cancun, Mexico
Bonnie Pendleton	2008-09	Stillwater, OK
Greg Cronholm	2007-08	Ft. Worth, TX
David Thompson	2006-07	Corpus Christi, TX
Bart Drees	2005-06	Austin, TX
Phil Mulder	2004-05	Albuquerque, NM
John D. Burd	2003-04	Lubbock, TX
Terry Mize	2002-03	Oklahoma City, OK
W. Pat Morrison	2001-02	Guanajuato, Mexico
Jim Reinert	2000-01	San Antonio, TX
James A. Webster	1999-00	Ft. Worth, TX
Carol Sutherland	1998-99	Las Cruces, NM
Ann Weise	1997-98	Corpus Christi, TX
Pete Lingren	1996-97	Oklahoma City, OK
Charles L. Cole	1995-96	Austin, TX
J. Terry Pitts	1994-95	Dallas, TX
Sidney E. Kunz	1993-94	Monterrey, Mexico
John G. Thomas	1992-93	Albuquerque, NM
Don Bull	1991-92	Tulsa, OK
Aithel McMahon	1990-91	College Station, TX
Russel E. Wright	1989-90	San Antonio, TX
Joyce Devaney	1988-89	El Paso, TX
Russ Andress	1987-88	Dallas, TX
Don Rummel	1986-87	Austin, TX
John E. George	1985-86	Monterrey, Mexico
Paul D. Sterling	1984-85	San Antonio, TX
H. Grant Kinzer	1983-84	Oklahoma City, OK
James R. Coppedge	1982-83	Corpus Christi, TX
Bill C. Clymer	1981-82	El Paso, TX
Horace W. VanCleave	1980-81	San Antonio, TX
Robert L. Harris	1979-80	Brownsville, TX
Jimmy K. Olson	1978-79	Houston, TX
J. Pat Boyd	1977-78	Lubbock, TX
Robert A. Hoffman	1976-77	Guadalajara, Mexico
Weldon H. Newton	1975-76	Oklahoma City, OK
Harry L. McMenemy	1974-75	El Paso, TX
Roger O. Drummond	1973-74	Dallas, TX
Dieter S. Enkerlin	1972-73	San Antonio, TX
Stanley Coppock	1971-72	Mexico City, Mexico

Chairman	Year	Meeting Location
C.A. King, Jr.	1970-71	El Paso, TX
Ted McGregor	1969-70	Brownsville, TX
Neal M. Randolph	1968-69	Dallas, TX
Walter McGregor	1967-68	Oklahoma City, OK
Harvey L. Chada	1966-67	San Antonio, TX
R.L. Hanna	1965-66	El Paso, TX
H.E. Meadows	1964-65	Austin, TX
Dial E. Martin	1963-64	Monterrey, Mexico
Manning A. Price	1962-63	Houston, TX
Sherman W. Clark	1961-62	Oklahoma City, OK
O.H. Graham	1960-61	San Antonio, TX
Clyde A. Bower	1959-60	El Paso, TX
Paul Gregg	1958-59	Dallas, TX
C.R. Parencia	1957-58	Houston, TX
J.C. Gaines	1956-57	San Antonio, TX
D.C. Earley	1955-56	Ft. Worth, TX
John M. Landrum	1954-55	Houston, TX
D.E. Howell	1953-54	Dallas, TX
P.J. Reno	1952-53	Galveston, TX
R.C. Bushland	1951-52	San Antonio, TX
H.G. Johnston*	1950-51	Dallas, TX

*** Southwestern Branch, American Association of Economic Entomologists**

Plenary Session Schedule

TUESDAY, APRIL 11, 2017

Lake Travis/LBJ (Woodward Conference Center)

8:00 AM **AM Welcome and Call to Order**
Carlos Bográn, President – Southwestern Branch, ESA

8:10 AM **Welcome from the Society of Southwestern Entomologists**
Wizzie Brown, President – Society of Southwestern Entomologists

8:20 AM **AM ESA Presidential Address**
Susan Weller, ESA President

8:50 AM **ESA Society Update**
David Gammel, Executive Director at Entomological Society of America

9:00 AM **Entomological Foundation Update**
Andrine Shufran, Member – Board of Counselors

9:10 AM **Board Certified Entomologists Report**
Molly Keck, Branch Representative

9:20 AM **In Memoriam Committee Report**
Phil Mulder, Jr., Chair

9:40 AM **Nominating Committee Report**
Jerry Michels, Chair

9:50 AM **Local Arrangements Announcements**
Wizzie Brown, Chair

Program Announcements
Juliana Rangel and Laura Weiser Erlandson, Program Chair & Vice-Chair

10:00 AM **Break**
Room: Highland Lakes Foyer

Program Summary

SUNDAY, APRIL 9, 2017

Program	Time	Location
ESA Staff	12:00 PM - 6:00 PM	Shoal Creek
Insect Expo Staging	12:00 PM - 11:55 PM	San Gabriel
Texas A&M University Agrilife Meeting	1:00 PM - 6:00 PM	Executive Learning Center

MONDAY, APRIL 10, 2017

Program	Time	Location
ESA Staff, Presentation Upload & Preview	7:00 AM - 3:00 PM	Shoal Creek
Texas A&M University Agrilife Meeting	8:00 AM - 12:00 PM	Executive Learning Center
Insect Expo	9:00 AM - 1:00 PM	Highland Lakes Ballroom
Insect Expo	9:00 AM - 1:00 PM	Guadalupe/Barton Creek
Insect Expo	9:00 AM - 1:00 PM	Blanco
Southwestern Branch Executive Committee Meeting	10:00 AM - 12:00 PM	Capitol Board Room
Lunch on your own	12:00 PM - 1:00 PM	
Insect Expo Take-Down	1:00 PM - 2:00 PM	Blanco

MONDAY, APRIL 10, 2017 …continued		
Insect Expo Take-Down	1:00 PM - 2:00 PM	Guadalupe/Barton Creek
Insect Expo Take-Down	1:00 PM - 2:00 PM	Highland Lakes Ballroom
Insect Expo Take-Down	1:00 PM - 2:00 PM	Lake Austin
Meeting Registration	1:00 PM - 5:00 PM	Highland Lakes Foyer
ESA Staff, Presentation Upload & Preview	3:00 PM - 5:00 PM	Blanco
Society of Southwestern Entomologists Executive Committee Meeting	3:00 PM - 4:00 PM	Guadalupe/Barton Creek
Society of Southwestern Entomologists General Membership Meeting	4:00 PM - 5:00 PM	Guadalupe/Barton Creek
Silent Auction	5:00 PM - 6:00 PM	Blanco
Welcome Social	5:00 PM - 7:00 PM	Bar
Student Competition Poster Set-Up	6:00 PM - 8:00 PM	Lake Austin
Student Affairs Committee Meeting / Photo Salon Judging	8:00 PM - 10:00 PM	Capitol Board Room

TUESDAY, APRIL 11, 2017		
Program	**Time**	**Location**
ESA Staff, Presentation Upload & Preview	7:00 AM - 5:00 PM	Blanco
Meeting Registration	7:00 AM - 5:00 PM	Highland Lakes Foyer
Silent Auction	7:00 AM - 5:30 PM	Blanco
Plenary Session	8:00 AM - 10:00 AM	Lake Travis/LBJ
Student Competition - Ph.D. Posters	8:00 AM - 12:00 PM	Lake Austin
Student Competition - Undergraduate Posters	8:00 AM - 12:00 PM	Lake Austin
Student Competition - Master's Posters	8:00 AM - 12:00 PM	Lake Austin
Break	10:00 AM - 10:20 AM	Highland Lakes Foyer
Student Competition: Undergraduate Ten-Minute Papers	10:25 AM - 1:30 PM	Guadalupe
Buffet Lunch	11:30 AM - 12:30 PM	Lake Travis/LBJ
Current trends in social insect biology	12:30 PM - 5:00 PM	Executive Learning Center
Student Competition: Ph.D. Ten-Minute Papers	12:30 PM - 5:00 PM	Barton Creek
Student Competition: Master's Ten-Minute Papers	1:30 PM - 3:45 PM	Guadalupe
Break	2:25 PM - 2:55 PM	Highland Lakes Foyer
Student Competition Poster Removal	4:00 PM - 6:00 PM	Lake Austin
Linnaean Games - Preliminary Round	5:00 PM - 7:00 PM	Lady Bird Lake
Regular Posters Set-up	6:00 PM - 8:00 PM	Lake Austin
Student Social	7:00 PM - 10:00 PM	Lake Travis/LBJ

WEDNESDAY, APRIL 12, 2017

Program	Time	Location
ESA Staff, Presentation Upload & Preview	7:00 AM - 5:00 PM	Blanco
Meeting Registration	7:00 AM - 3:00 PM	Highland Lakes Foyer
Silent Auction	7:00 AM - 3:00 PM	Blanco
Urban Research and Outreach Programs in the Southwest	8:00 AM - 11:00 AM	Barton Creek
Regular Ten-Minute Oral	8:00 AM - 12:00 PM	Guadalupe
Insects in Food and Feed	8:00 AM - 12:55 PM	Executive Learning Center
Regular poster presentations	8:00 AM - 3:00 PM	Lake Austin
Advances in thrips management and the diseases they vector in the Southwestern US	9:00 AM - 12:00 PM	Lady Bird Lake
Break	10:00 AM - 10:20 AM	Highland Lakes Foyer
Lunch on your own	12:00 PM - 1:00 PM	
Extension entomologists in action: updates from the field and lessons to build effective extension education programs	12:45 PM - 4:45 PM	Guadalupe
Public and veterinary health: What is a vector biologist's role	1:00 PM - 4:00 PM	Lady Bird Lake
Regular Ten-Minute Orals	1:15 PM - 4:15 PM	Executive Learning Center
Break	2:15 PM - 2:45 PM	Highland Lakes Foyer
Regular Poster Removal	4:00 PM - 6:00 PM	Lake Austin
Linnaean Games - Final Round	5:00 PM - 7:00 PM	Lady Bird Lake
Awards Banquet, Photo Salon & Final Business Meeting	7:30 PM - 10:00 PM	Lake Travis/LBJ

THURSDAY, APRIL 13, 2017

Program	Time	Location
ESA Staff	7:00 AM - 3:00 PM	Blanco
Southwestern Branch Executive Committee Meeting	8:00 AM - 10:00 AM	Capitol Board Room

Oral & Poster Presentation Schedule

TUESDAY, APRIL 11, 2017, MORNING

Student Competition: Undergraduate Ten-Minute Papers

Guadalupe (Woodward Conference Center)

Moderators: Laura Erlandson, Texas A&M Univ. - Central Texas, Killeen, TX

10:25 AM **Introductory Remarks**

10:30 AM 1-1 **Age-dependent variation of vitellogenin transcripts in male fire ants (*Solenopsis invicta*).**
Colin Roper *(razmonk@tamu.edu), Chloë Hawkings and Cecilia Tamborindeguy, Texas A&M Univ., College Station, TX*

10:42 AM 1-2 **Assessing the importance of blow flies *(Cochliomyia macellaria)* as potential pollinators in our ecosystem.**
Emily Hildinger *(yellow17@tamu.edu), Pierre Lau, Juliana Rangel, Vaughn Bryant and Aaron Tarone, Texas A&M Univ., College Station, TX*

10:54 AM 1-3 **Assessing the sublethal effects of bifenazate on honey bee (*Apis mellifera* L.) sucrose response thresholds.**
Olalekan Falokun *(falokun@tamu.edu)[1], Adrian Fisher II[2], Pierre Lau[2], Julie Mustard[3], Makaylee Crone[1] and Juliana Rangel[2], [1]Texas A&M Entomology, College Station, TX, [2]Texas A&M Univ., College Station, TX, [3]The Univ. of Texas Rio Grande Valley, Brownsville, TX*

11:06 AM 1-4 **Bigger not better: Smaller carrion sizes positively correlate with fly production.**
Victoria Pickens *(vpicken@ostatemail.okstate.edu)[1] and W. Wyatt Hoback[2], [1]Oklahoma State Univ., Stilwater, OK, [2]Oklahoma State Univ., Stillwater, OK*

11:18 AM 1-5 **Controlling aphid populations in daylily crops using green lacewings *(Chrysoperla rufilabris).***
Bret Nash *(Bret2012@tamu.edu), Texas A&M Univ., College Station, TX*

11:30 AM **Break**

12:30 PM **Welcome back remarks**

12:35 PM 1-6 **Density-dependent phenotypic plasticity in *Schistocerca lineata* Scudder, 1899 (Orthoptera: Acrididae).**
Shelby Kilpatrick *(entorocks527@tamu.edu), Bert Foquet and Hojun Song, Texas A&M Univ., College Station, TX*

12:47 PM 1-7 **Evaluating various insecticide baits against multiple house fly (Diptera: Muscidae) strains under laboratory conditions.**
Ramon Zepeda *(rz@nmsu.edu) and Brandon Smythe, New Mexico State Univ., Las Cruces, NM*

12:59 PM 1-8 **Fire ant (*Solenopsis invicta*) interactions with green milkweed (*Asclepias viridis*) insect communities.**
Payal Patel *(ppatel14@austincollege.edu), Sydney Jackson and Loriann Garcia, Austin College, Sherman, TX*

1:11 PM 1-9 **The effects of pyriproxyfen exposure on honey bee (*Apis mellifera*) sucrose sensitivity.**
Makaylee Crone *(makaylee.crone22@tamu.edu)[1], Olalekan Falokun[1], Adrian Fisher II[2], Pierre Lau[2], Julie Mustard[3] and Juliana Rangel[2], [1]Texas A&M Entomology, College Station, TX, [2]Texas A&M Univ., College Station, TX, [3]The Univ. of Texas Rio Grande Valley, Brownsville, TX*

TUESDAY, APRIL 11, 2017, AFTERNOON

Current trends in social insect biology

Executive Learning Center (Woodward Conference Center)

Moderators and Organizers: Juliana Rangel and Edward Vargo, Texas A&M Univ., College Station, TX

12:30 PM **Introductory Remarks**

12:35 PM 2-1 **Success of young ant colonies: Using experimental transplants to understand growth and survival.**
Blaine J. Cole *(bcole@uh.edu), Univ. of Houston, Houston, TX*

12:53 PM 2-2 **Intracolony transmission of the microsporidian pathogen (*Myrmecomorba nylanderiae*) and its impact upon the growth of tawny crazy ant (*Nylanderia fulva*) colonies.**
Ed LeBrun *(edwardlebrun@austin.utexas.edu)[1], Kristina Ottens[2] and Lawrence E. Gilbert[1], [1]The Univ. of Texas, Austin, TX, [2]The Univ. of Iowa, Iowa City, IA*

1:11 PM 2-3 **Eat, signal and reproduce: Expression changes in the brain associated with feeding and/or mating in fire ants.**
Patricia Pietrantonio *(p-pietrantonio@tamu.edu)[1], Mei-Er Chen[2] and Cecilia Tamborindeguy[1], [1]Texas A&M Univ., College Station, TX, [2]National Chung Hsing Univ., Taichung, Taiwan*

1:29 PM 2-4 **Behavior, microbiomes and symbiont specificity of two co-occurring fungus-gardening ant species.**
Jon Seal *(trachymyrmex@gmail.com), The Univ. of Texas, Tyler, TX*

1:47 PM **Break**

2:02 PM 2-5 **What can experimental mating tell us about the evolution of polyandry in ants?**
Diane Wiernasz *(dwiernasz@uh.edu), Univ. of Houston, Houston, TX*

2:20 PM 2-6 **Influence of queens on the foraging behavior of *Nylanderia fulva* and *Solenopsis invicta.***
Pierre Lesne *(pierre.lesne@exchange.tamu.edu)[1], Audrey Dussutour[2] and Spencer T. Behmer[1], [1]Texas A&M Univ., College Station, TX, [2]Universite Paul Sabatier, Toulouse, France*

2:38 PM 2-7 **Beyond the big easy: Reconstructing the global invasion history of the termite *Reticulitermes flavipe.***
Edward Vargo *(ed.vargo@tamu.edu)[1], Elfie Perdereau[2], Franck Dedeine[3] and A. G. Bagnères[4], [1]Texas A&M Univ., College Station, TX, [2]Universite de Tours, Tours, France, [3]National Center for Scientific Research, Tours, France, [4]Univ. de Tours, Tours, France*

2:56 PM 2-8 **Metabolic gas emissions by termites on a tallgrass prairie.**
Charles Konemann *(charles.e.konemann@okstate.edu) and Brad Kard, Oklahoma State Univ., Stillwater, OK*

3:14 PM **Break 2**

3:29 PM 2-9 **Genetic composition and *Nosema* spp. infection levels in feral and managed honey bee (*Apis mellifera*) colonies in Southwestern PA.**
Juliana Rangel *(jrangel@tamu.edu)[1], Brenna E. Traver[2], Christopher Garza[3], Alejandra Gonzalez[1], Brian Trevelline[4], Thomas D. Seeley[5] and John Wenzel[6], [1]Texas A&M Univ., College Station, TX, [2]Penn State Schuylkill, Schuylkill Haven, PA, [3]Houston Arboretum and Nature Center, Houston, TX, [4]Duquesne Univ., Pittsburgh, PA, [5]Cornell Univ., Ithaca, NY, [6]Carnegie Museum of Natural History, Rector, PA*

3:47 PM 2-10 **Haemolymph glucose flux is important for long-term memory formation in the honey bee (*Apis mellifera*).**
Nicola Simcock *(Nicola.Simcock@newcastle.ac.uk)[1], Geraldine A. Wright[1], Sofia Bouchebti[2] and Helen Gray[3], [1]Newcastle Univ., Newcastle upon Tyne, United Kingdom, [2]Paul Sabatier Univ. - Toulouse III, Tolouse, France, [3]Newcastle Univ., Newcastle Upon Tyne, United Kingdom*

4:05 PM 2-11 **Artificial selection on beneficial gut microbiomes of bees.**
Ulrich G. Mueller *(umueller@austin.utexas.edu)[1], Rong Ma[1], Peter Graystock[2] and Quinn McFrederick[2], [1]The Univ. of Texas, Austin, TX, [2]Univ. of California, Riverside, CA*

4:23 PM 2-12 **Antibiotic exposure perturbs the gut microbiota and elevates mortality in honey bees (*Apis mellifera*).**
Kasie Raymann *(kraymann86@gmail.com), Zack Shaffer and Nancy Moran, Univ. of Texas at Austin, Austin, TX*

Student Competition: Ph.D. Ten-Minute Papers

Barton Creek (Woodward Conference Center)

Moderators: Guilherme Klafke, USDA-ARS Cattle Fever Tick Research Laboratory, Edinburg, TX

12:30 PM **Introductory Remarks**

12:35 PM 3-1 **Bacterial community diversity of *Solenopsis invicta* Buren according to colony, ecoregion, and functional category.**
Elida Espinoza *(ellyspnz@gmail.com)[1], Tawni L. Crippen[2], Roger Gold[1], Aaron Tarone[1] and Jeffery Tomberlin[1], [1]Texas A&M Univ., College Station, TX, [2]USDA - ARS, College Station, TX*

12:47 PM 3-2 **The influence of brood on transcriptional variation in the worker brain of the red imported fire ant (*Solenopsis invicta*).**
Chloë Hawkings *(chloe.hawks@tamu.edu) and Cecilia Tamborindeguy, Texas A&M Univ., College Station, TX*

12:59 PM 3-3 **Arthropod composition of pitfall traps containing non-target vertebrates.**
Britt Smith *(britt.smith@ttu.edu) and Robin Verble, Texas Tech Univ., Lubbock, TX*

1:11 PM 3-4 **Assesment of single trap sampling of the American burying beetle (*Nicrophorus americanus*) for estimation of population density in Southeast Oklahoma.**
Kris Giles and **Kyle Risser** *(kyle.risser@okstate.edu), Oklahoma State Univ., Stillwater, OK*

1:23 PM 3-5 Behavioral and molecular mechanisms of pheromone transmission in honey bees (*Apis mellifera*).
Rong Ma *(rong.ma@utexas.edu)[1], Gabriel Villar[2], Christina M. Grozinger[2] and Juliana Rangel[3], [1]The Univ. of Texas, Austin, TX, [2]Pennsylvania State Univ., Univ. Park, PA, [3]Texas A&M Univ., College Station, TX*

1:35 PM 3-6 Boll weevil (*Anthonomus grandis*) population genomics as a tool for monitoring and management.
Tyler Raszick *(tjraszick@gmail.com), Texas A&M Univ., College Station, TX*

1:47 PM 3-7 Characterization of the sugarcane aphid microbiome.
Jocelyn R. Holt *(holtjocelyn@tamu.edu)[1], Alex Styer[2], Josephine Antwi[3], J. Scott Armstrong[4], Jason Wulff[1], Jennifer A. White[2], Samuel Nibouche[5], Laurent Costet[5], Gary Peterson[6], Neal McLaren[7] and Raul F. Medina[1], [1]Texas A&M Univ., College Station, TX, [2]Univ. of Kentucky, Lexington, KY, [3]Oregon State Univ., Hermiston, OR, [4]USDA - ARS, Stillwater, OK, [5]CIRAD, Saint-Pierre, France, [6]Texas A&M, Lubbock, TX, [7]Univ. of the Free State, Bloemfontein, South Africa*

1:59 PM 3-8 Cross mating of two sympatric and morphologically similar ticks: *Amblyomma mixtum* and *A. tenellum* (Acari: Ixodidae).
Taylor Donaldson *(taylorgdonaldson@email.tamu.edu), Pete Teel, Michael Longnecker and Otto Strey, Texas A&M Univ., College Station, TX*

2:11 PM 3-9 Detection of resistance in sorghum lines against sugarcane aphid, *Melanaphis sacchari* (Zehnter).
Sulochana Paudyal *(sulochana.paudyal@okstate.edu)[1], J. Scott Armstrong[2], Kris Giles[1] and Ankur Limaje[1], [1]Oklahoma State Univ., Stillwater, OK, [2]USDA - ARS, Stillwater, OK*

2:23 PM Break

2:38 PM 3-10 Determining the minimum number of pollen grains needed for accurate honey bee (*Apis mellifera*) pollen pellet analysis.
Pierre Lau *(plau0168@tamu.edu), Vaughn Bryant and Juliana Rangel, Texas A&M Univ., College Station, TX*

2:50 PM 3-11 Evaluation of the *Aphidius colemani-Rhopalosiphum padi* banker plant system in Oklahoma greenhouse production.
Tracey Payton Miller *(tracey.payton@okstate.edu)[1], Eric Rebek[1], Steven Frank[2], Kris Giles[1] and Mike Schnelle[1], [1]Oklahoma State Univ., Stillwater, OK, [2]North Carolina State Univ., Raleigh, NC*

3:02 PM 3-12 Metabolic theory, nutritional ecology, and seasonal foraging in a prairie ant community.
Rebecca Prather *(rebeccaprather@ou.edu) and Michael Kaspari, Univ. of Oklahoma, Norman, OK*

3:14 PM 3-13 Scalar habitat analysis of bee communities across agroecosystems on the Texas High Plains.
Samuel Discua *(samuel.discua@ttu.edu), Scott Longing and Nancy McIntyre, Texas Tech Univ., Lubbock, TX*

3:26 PM 3-14 The effects of soilborne pathogens on the colony structure of the eastern subterranean termite (*Reticulitermes flavipes*).
Carlos Aguero *(cague001@tamu.edu)[1], Jason Martin[2], Mark S Bulmer[2] and Edward Vargo[1], [1]Texas A&M Univ., College Station, TX, [2]Towson Univ., Towson, MD*

3:38 PM 3-15 The negative effects of in-hive pesticides on honey bee (*Apis mellifera*) drone spermatozoa viability.
Adrian Fisher II *(solifuge9378@tamu.edu) and Juliana Rangel, Texas A&M Univ., College Station, TX*

3:50 PM 3-16 Utilizing stratified sampling data to develop a scouting plan for sugarcane aphid, *Melanaphis sacchari* Zehntner, in sorghum.
Jessica Lindenmayer *(jessica.pavlu@okstate.edu)[1], Tom Royer[1], Kris Giles[1], Ali Zarrabi[1], Allen Knutson[2], Robert Bowling[3], Nicholas Seiter[4], Brian McCornack[5], Sebe Brown[6] and Norman Elliott[7], [1]Oklahoma State Univ., Stillwater, OK, [2]Texas A&M Univ., Dallas, TX, [3]Texas A&M AgriLife Extension Service, Corpus Christi, TX, [4]Univ. of Arkansas, Monticello, AR, [5]Plant Biosecurity Cooperative Research Centre, Bruce, Australia, [6]Louisiana State Univ. AgCenter, Winnsboro, LA, [7]USDA - ARS, Stillwater, OK*

4:02 PM 3-17 What is underreplication and how does this phenomenon contribute to the enigma of genome size evolution in *Drosophila*?
Carl Hjelmen *(cehjelmen09@tamu.edu) and J. Spencer Johnston, Texas A&M Univ., College Station, TX*

4:14 PM 3-18 Who, where, and when? A survey of Texas blow flies (Diptera: Calliphoridae).
Ashleigh Faris *(ashmfaris@gmail.com), Maegan Fitzgerald and Aaron Tarone, Texas A&M Univ., College Station, TX*

Student Competition: Master's Ten-Minute Papers

Guadalupe (Woodward Conference Center)

Moderators: Michael Brewer, Texas A&M AgriLife Research, Corpus Christi, TX

1:30 PM **Introductory Remarks**

1:35 PM 4-1 **Population genetics and colony breeding structure of the tawny crazy ant (*Nylanderia fulva*).**
Bryant McDowell *(bryant868@tamu.edu), Robert Puckett and Edward Vargo, Texas A&M Univ., College Station, TX*

1:47 PM 4-2 **A phylogeny of Tristiridae (Orthoptera: Acridoidea) using molecular data.**
Ryan Selking *(Optimus1@tamu.edu)[1], Maria Marta Cigliano[2] and Hojun Song[1], [1]Texas A&M Univ., College Station, TX, [2]Univ. of Illinois at Urbana-Champaign, La Plata, Argentina*

1:59 PM 4-3 **A darter's diet: Macroinvertebrate diet of the orangebelly darter (*Etheostoma radiosum*).**
Melissa Reed *(mleath@okstate.edu)[1], W. Wyatt Hoback[2], James Long[3] and Andrew Dzialowski[3], [1]Oklahoma State Univ., Skiatook, OK, [2]Oklahoma State Univ., Stillwater, OK, [3]Oklahoma State Univ., Stillwater,, OK*

2:11 PM 4-4 **A laboratory rearing and bioassay chamber for thrips (Thysanoptera).**
Alvaro Romero-Castillo *(alv89@outlook.com)[1] and Sergio Sanchez-Peña[2], [1]Universidad Autonoma Agraria Antonio Narro, Saltillo, Mexico, [2]Universidad Autónoma Agraria Antonio Narro, Saltillo, Mexico*

2:23 PM **Break**

2:33 PM 4-5 **American burying beetle *(Nicrophorus americanus)* are most frequent in grassland habitats at Camp Gruber, OK.**
Lexi Freeman *(lexi.freeman@okstate.edu) and W. Wyatt Hoback, Oklahoma State Univ., Stillwater, OK*

2:45 PM 4-6 **Arbor day and the effect of hand-planted Nebraska forests on the American burying beetle.**
Jacob Farriester *(jacob.farriester@okstate.edu)[1], W. Wyatt Hoback[2] and Daniel G. Snethen[3], [1]Oklahoma State Univ. (Stillwater), Stillwater, OK, [2]Oklahoma State Univ., Stillwater, OK, [3]Little Wound High School, Kyle, SD*

2:57 PM 4-7 **Effect of temperature on development of sugarcane aphid, *Melanaphis sacchari*, on sorghum.**
Philip Hinson *(philison2@gmail.com) and Bonnie Pendleton, West Texas A&M Univ., Canyon, TX*

3:09 PM 4-8 **Evaluating insecticide efficacy and residual activity for control of the sugarcane aphid *Melanaphis sacchari* (Zehntner).**
John David Gonzales *(johndavid.gonzales@ag.tamu.edu)[1], David Kerns[2] and Greg Wilson[3], [1]Texas A&M Agrilife Extension Service, Muleshoe, TX, [2]Texas AgriLife Extension Service, College Station, TX, [3]Texas A & M Univ., Bryan, TX*

3:21 PM 4-9 **Cattle fever tick, *Rhipicephalus (Boophilus) microplus* (Acari: Ixodidae) potential control on pastures by the application of urea fertilizer.**
Brenda Leal *(brenda.leal01@utrgv.edu)[1], Don Thomas[2] and Robert Dearth[1], [1]Univ. of Texas Rio Grande Valley, Edinburg, TX, [2]USDA - ARS, Edinburg, TX*

TUESDAY, APRIL 11, 2017, POSTERS

Student Competition - Ph.D. Posters

Lake Austin (Woodward Conference Center)

P1-1 **Efficacy of botanicals to control maize weevils (Coleoptera: Curculionidae) in stored sorghum grain.**
Hame Abdou Kadi Kadi *(hkadikadi@yahoo.com) and Bonnie Pendleton, West Texas A&M Univ., Canyon, TX*

P1-2 **Corn hybrid and *Bt* transgene performance in yield and protection from pre-harvest losses caused by lepidopteran feeding.**
Luke Pruter *(lpruter@tamu.edu)[1], Michael Brewer[2], Mac Young[3] and Julio S. Bernal[4], [1]Texas A&M, Bryan, TX, [2]Texas A&M AgriLife Research, Corpus Christi, TX, [3]Agricultural Economics, Corpus Christi, TX, [4]Texas A&M Univ., College Station, TX*

P1-3 **Mosquito larvicidal activity of new entomopathogenic nematodes from Northeastern Mexico.**
Diego Treviño-Cueto *(diego.-tc@hotmail.com)[1] and Sergio Sanchez-Peña[2], [1]Universidad Autonoma Agraria Antonio Narro, Saltillo, Mexico, [2]Universidad Autónoma Agraria Antonio Narro, Saltillo, Mexico*

Student Competition - Undergraduate Posters

Lake Austin (Woodward Conference Center)

P2-1 **Effect of minerals on the distribution of ear ticks (*Otobius megnini*) within animal shelters at the Fossil Rim Wildlife Center.**
Hannah Walker *(hannahag16@gmail.com) and David H. Kattes, Tarleton State Univ., Stephenville, TX*

P2-2 **Evaluation of new methods for small hive beeetle *Aethina tumida* (Coleoptera: Nitidulidae) removal in managed honey bee *Apis mellifera* (Hymenoptera: Apidae) colonies in East Texas.**
Mark Barbosa *(jeffreybarb0827@email.tamu.edu) and Juliana Rangel, Texas A&M Univ., College Station, TX*

P2-3 **Questing behavior and presence of tick-borne pathogens in *Ixodes scapularis* in Oklahoma.**
Justin Turner *(justin.turner11@okstate.edu)[1], Trisha Dubie[2] and Bruce Noden[2], [1]Oklahoma State University, Stillwater, OK, [2]Oklahoma State Univ., Stillwater, OK*

P2-4 **Neonicotinoid insecticide resistance in populations of the potato psyllid (*Bactericera cockerelli*) across Texas.**
Kristyne Varela *(kristyne.varela@ag.tamu.edu)[1] and Ada Szczepaniec[2], [1]West Texas A&M Univ., Canyon, TX, [2]Texas A&M AgriLife Research, Amarillo, TX*

P2-5 **Field evaluation of standard pressurized spray application to application with a mist blower applicator of four acaricides for the control of lone star ticks (*Amblyomma americanum*) in turf.**
Rylee Wilson *(rylee.wilson@okstate.edu)[1], Kylie Sherrill[2], Kelli Black[1], Nathan R. Walker[2] and Justin Talley[2], [1]Oklahoma State Unviversity, Stillwater, OK, [2]Oklahoma State Univ., Stillwater, OK*

P2-6 **Identifying co-circulating hemoparasites in the WNV transmission cycle in East Texas.**
Dayvion Adams *(ajadams968@tamu.edu), Gabriel Hamer, Matthew Medeiros and Andrew Golnar, Texas A&M Univ., College Station, TX*

P2-7 **Is body size of metallic green sweat bees *Agapostemon* spp. (Hymenoptera: Halictidae) related to floral resource abundance?**
Bryan Guevara *(bryan.larrea@ttu.edu), Samuel Discua and Scott Longing, Texas Tech Univ., Lubbock, TX*

P2-8 **Habitat associations of darkling beetles (Coleoptera: Tenebrionidae) at the Monahans Dune System of Western Texas.**
Torie Whisenant *(torie.whisenant@ttu.edu), John Bennett, Samuel Discua and Scott Longing, Texas Tech Univ., Lubbock, TX*

P2-9 **Beneficial insects of mass-flowering wildflowers across agricultural landscapes on the Texas High Plains.**
Robert Wright *(robert.l.wright@ttu.edu), Bryan Guevara, Samuel Discua and Scott Longing, Texas Tech Univ., Lubbock, TX*

P2-10 **Developing a novel assay to identify permethrin resistant horn fly (Diptera: Muscidae) populations.**
Derek Cosper *(dcosper@nmsu.edu) and Brandon Smythe, New Mexico State Univ., Las Cruces, NM*

P2-11 **Masked killers: A laboratory exercise on dragonfly predation of mosquito larvae.**
Thomas Hess *(tmhess@okstate.edu), W. Wyatt Hoback and Bruce Noden, Oklahoma State Univ., Stillwater, OK*

P2-12 **Acaricide target gene sequences in the cattle tick, *Rhipicephalus (Boophilus) annulatus.***
Hannah Moreno *(hannah.moreno01@utrgv.edu)[1], Jason Tidwell[2], Guilherme Klafke[3], Robert J. Miller[2] and Adalberto A. Pérez de León[4], [1]UTRGV, Edinburg, TX, [2]USDA - ARS, Edinburg, TX, [3]USDA-ARS Cattle Fever Tick Research Laboratory, Edinburg, TX, [4]USDA - ARS, Kerrville, TX*

Student Competition - Master's Posters

Lake Austin (Woodward Conference Center)

P3-1 ***Aschersonia* and other fungal pathogens of Hemiptera from Mexico, and their activity against whiteflies (Aleyrodidae).**
Renato Villegas-Luján *(renato_villegas1988@hotmail.com)[1], Reyna Torres-Acosta[2] and Sergio Sanchez-Peña[2], [1]Universidad Autonoma Agraria Antonio Narro, Saltillo, Mexico, [2]Universidad Autónoma Agraria Antonio Narro, Saltillo, Mexico*

P3-2 **Investigating the thermal limits and requirements that affect the biology of the sugarcane aphid, *Melanaphis sacchari*, (Zehntner, 1897).**
Misael de Souza *(misael.de_souza@okstate.edu)[1], W. Wyatt Hoback[2], J. Scott Armstrong[3] and Phillip G. Mulder[2], [1]Oklahoma State Univ., STILLWATER, OK, [2]Oklahoma State Univ., Stillwater, OK, [3]USDA - ARS, Stillwater, OK*

P3-3 **Abundance of native bees and managed honey bees across pumpkin fields on the Texas High Plains.**
Christopher Jewett *(christopher.jewett@ttu.edu) and Scott Longing, Texas Tech Univ., Lubbock, TX*

P3-4 **Demystifying kissing bugs for a broad audience: Identification guide to Chagas disease vector species of the United States (Hemiptera: Reduviidae: Triatominae).**
Justin Bejcek *(jbejcek13@tamu.edu)[1], Gabriel Hamer[2] and Sarah Hamer[2], [1]Texas A&M Univ., Celina, TX, [2]Texas A&M Univ., College Station, TX*

P3-5 **Determining the functional morphology of the eggs of *Sinea* spp. (Heteroptera: Reduviidae).**
Danielle Lara *(djessie@nmsu.edu) and C. Scott Bundy, New Mexico State Univ., Las Cruces, NM*

P3-6 **The reproductive potential of the sugarcane aphid on susceptible and resistant sorghums from the Lubbock USDA-ARS germplasm**
Ankur Limaje *(ankur.limaje@gmail.com)[1], Chad Hayes[2], J. Scott Armstrong[3], W. Wyatt Hoback[1], Ali Zarrabi[1], Sulochana Paudyal[1] and John Burke[2], [1]Oklahoma State Univ., Stillwater, OK, [2]USDA-ARS, Lubbock, TX, [3]USDA - ARS, Stillwater, OK*

P3-7 **Late season surveys reveal activity of American burying beetles (*Nicrophorus americanus)* in Oklahoma.**
Dan St. Aubin *(danbs@okstate.edu)[1] and W. Wyatt Hoback[2], [1]Oklahoma Satte Univ., Stillwater, OK, [2]Oklahoma State Univ., Stillwater, OK*

P3-8 **Screening of novel antigens for the control of *Boophilus microplus* through artificial feeding.**
Charluz Arocho Rosario *(marioli@tamu.edu)[1], Robert J. Miller[2], Pete Teel[3], Adalberto A. Pérez de León[4] and Felix Guerrero[4], [1]Texas A&M, college station, TX, [2]USDA - ARS, Edinburg, TX, [3]Texas A&M Univ., College Station, TX, [4]USDA - ARS, Kerrville, TX*

P3-9 **Survival of stored-product psocids (Psocoptera: Liposcelididae) at 50% relative humidity.**
Abena Ocran *(abena.ocran@okstate.edu), George Opit, Kandara Shakya and Sandipa G. Gautam, Oklahoma State Univ., Stillwater, OK*

P3-10 **Synergism of pyrethroids with inhibitors in resistant bed bugs (*Cimex lectularius*).**
Maria Gonzalez-Morales *(mgonzal@nmsu.edu) and Alvaro Romero, New Mexico State Univ., Las Cruces, NM*

WEDNESDAY, APRIL 12, 2017, MORNING

Urban Research and Outreach Programs in the Southwest

Barton Creek (Woodward Conference Center)

Moderators and Organizers: Wizzie Brown[1], Molly Keck[2] and Janet Hurley[3], [1]Texas A&M Univ., Austin, TX, [2]Texas AgriLife Extension Service, San Antonio, TX, [3]Texas A&M AgriLife Extension Service, Dallas, TX

8:00 AM **Introductory Remarks**

8:05 AM 5-1 **Crape myrtle bark scale phenology and management.**
Erfan Vafaie *(erfanv@tamu.edu)[1], Michael Merchant[2] and Mengmeng Gu[3], [1]Texas A&M AgriLife Extension Service, Overton, TX, [2]Texas A&M AgriLife Extension Service, Dallas, TX, [3]Texas A&M Univ., College Station, TX*

8:25 AM 5-2 **Urban entomology at Texas A&M University: Highlights of research and extension activities at the Rollins Urban and Structural Entomology Facility.**
Robert Puckett *(rpuck@tamu.edu), Texas A&M Univ., College Station, TX*

8:45 AM 5-3 **Quantifying the financial costs of school IPM.**
Janet Hurley *(ja-hurley@tamu.edu), Texas A&M AgriLife Extension Service, Dallas, TX*

9:05 AM **Break**

9:20 AM 5-4 **Evaluation of SenSci active lures for increasing pitfall catches of bed bugs.**
Michael Merchant *(m-merchant@tamu.edu), Texas A&M AgriLife Extension Service, Dallas, TX*

9:40 AM 5-5 **5 year efficacy of Termidor® HE high efficiency termiticide for control of subterranean termites.**
Bob Davis *(robert.davis@basf.com), BASF, Pflugerville, TX*

10:00 AM 5-6 **Efficacy of Fendona as a general pesticide barrier on homes.**
Molly Keck *(mekeck@ag.tamu.edu)[1] and Kim Engler[2], [1]Texas AgriLife Extension Service, San Antonio, TX, [2]ABC Home & Commercial Services, San Antonio, TX*

10:20 AM 5-7 **Pest exclusion using physical barriers: A sustainable future for new and existing structures.**
Cassie Krejci *(ckrejci@polyguard.com)[1], Roger Gold[2] and Chris Keefer[3], [1]Polyguard, Ennis, TX, [2]Texas A&M Univ., College Station, TX, [3]Syngenta, College Station, TX*

10:40 AM 5-8 **Wood Glen: Ten years of community wide fire ant management.**
Wizzie Brown *(ebrown@ag.tamu.edu), Texas A&M Univ., Austin, TX*

Regular Ten-Minute Oral

Guadalupe (Woodward Conference Center)

Moderators: Pia Olafson[1] and Brandon Smythe[2], [1]USDA - ARS, Kerrville, TX, [2]New Mexico State Univ., Las Cruces, NM

8:00 AM **Introductory Remarks**

8:03 AM 6-1 **Impact of mycolactone produced by *Mycobacterium ulcerans* on life-history traits of *Aedes aegypti* (Diptera: Culicidae).**
Abadi Mashlawi *(amashlawi@tamu.edu)[1], Jordan Heather[2], Tawni Crippen[3] and Jeffery Tomberlin[1], [1]Texas A&M Univ., College Station, TX, [2]Jordan@biology.msstate.edu, Starkville, MS, [3]Agricultural Research Service, USDA, College Station, TX*

8:15 AM 6-2 **Bacterial volatiles mediate foraging behavior of the red imported fire ant.**
Jennifer H. Sweeney *(j_sweeney@tamu.edu)[1], Robert Puckett[1], Tawni L. Crippen[2] and Jeffery Tomberlin[1], [1]Texas A&M Univ., College Station, TX, [2]USDA - ARS, College Station, TX*

8:27 AM 6-3 **Phosphine resistance in *Oryzaephilus surinamensis* (Coleoptera: Silvanidae) in the United States.**
Zhaorigetu Hubhachen *(jorigtoo.chen@okstate.edu)[1], Sandipa Gautam[2], Charles Konemann[1], George Opit[1] and Ed Hosoda[3], [1]Oklahoma State Univ., Stillwater, OK, [2]Univ. of California at Riverside, Parlier, CA, [3]President, Cardinal Chemical Company, Woodland, CA*

8:39 AM 6-4 **Near infrared reflectance spectroscopy of bovine feces to detect the southern cattle tick, *Rhipicephalus (Boophilus) microplus.***
Brian Rich *(briantaylorrich@gmail.com)[1], Don Thomas[2], Adalberto A. Pérez de León[3], Pete Teel[1], Robert John Miller[4] and Doug Tolleson[5], [1]Texas A&M Univ., College Station, TX, [2]USDA - ARS, Edinburg, TX, [3]Knipling-Bushland US Livestock Insect Research Laboratory, Kerrville, TX, [4]USDA-ARS, Edinburg, TX, [5]Texas A&M Univ., San Angelo, TX*

8:51 AM 6-5 **Disrupting bacterial communication - a novel method for reducing mosquito attraction to a host.**
Dongmin Kim *(dongminkimkorea@gmail.com)[1], Tawni L. Crippen[2] and Jeffery Tomberlin[3], [1]Texas A&M, College Station, TX, [2]USDA - ARS, College Station, TX, [3]Texas A&M Univ., College Station, TX*

9:03 AM 6-6 **Discovery of populations of the yellow fever mosquito *Aedes aegypti* in Oklahoma after 70 years of absence.**
David Bradt *(dave.bradt@okstate.edu)[1], Kristy Bradley[2], W. Wyatt Hoback[1] and Bruce Noden[1], [1]Oklahoma State Univ., Stillwater, OK, [2]Oklahoma Dept. of Health, Oklahoma City, OK*

9:15 AM **Break**

9:30 AM 6-7 **Host immune response after repeated blood meal challenges by the relapsing fever tick, *Ornithodoros turicata*, Dugès (Ixodida: Argasidae).**
Hee Kim *(godzebu2002@yahoo.com)[1], Pete Teel[1], Job Lopez[2] and Adalberto A. Pérez de León[3], [1]Texas A&M Univ., College Station, TX, [2]Baylor College of Medicine, Houston, TX, [3]USDA - ARS, Kerrville, TX*

9:42 AM 6-8 **The horizontal transfer of *Salmonella* between the lesser mealworm (*Alphitobius diaperinus)* and their surrounding environment.**
Tawni L. Crippen *(tawni.crippen@ars.usda.gov), Cynthia L. Sheffield and Ross Beier, USDA - ARS, College Station, TX*

9:54 AM 6-9 **Management of the winter tick, *Dermacentor albipictus*, in Texas cow-calf production systems.**
Samantha Hays *(samanthahays_85@tamu.edu)[1], Pete Teel[1], Thomas Hairgrove[2], David Anderson[2], Sonja L. Swiger[3] and Jeffery Tomberlin[1], [1]Texas A&M Univ., College Station, TX, [2]Texas A&M AgriLife Research and Extension, College Station, TX, [3]Texas A&M Univ., Stephenville, TX*

10:06 AM 6-10 **Bacteria harbored by adult stable flies (Diptera: Muscidae) on Texas dairies.**
Pia Olafson *(pia.olafson@ars.usda.gov)[1] and Sonja L. Swiger[2], [1]USDA - ARS, Kerrville, TX, [2]Texas A&M Univ., Stephenville, TX*

10:18 AM 6-11 **Phenome of acaricide resistance in the southern cattle fever tick (*Rhipicephalus microplus*): Molecular marker development.**
Guilherme Klafke *(gmklafke@gmail.com)[1], Jason Tidwell[2], Daniela Sanchez[3], Nicholas Jonsson[4], Robert John Miller[5] and Adalberto A. Pérez de León[6], [1]USDA-ARS Cattle Fever Tick Research Laboratory, Edinburg, TX, [2]USDA - ARS, Edinburg, TX, [3]Univ. of Texas Rio Grande Valley, Edinburg, TX, [4]Univ. of Glasgow, Glasgow, United Kingdom, [5]USDA-ARS, Edinburg, TX, [6]USDA - ARS, Kerrville, TX*

10:30 AM 6-12 **Behavioral responses and growth performance of horn fly (Diptera: Muscidae) infested cattle in New Mexico.**
Brandon Smythe *(bsmythe@nmsu.edu), New Mexico State Univ., Las Cruces, NM*

10:42 AM 6-13 **Integrated control of the southern cattle fever tick, *Rhipicephalus* (*Boophilus*) *microplus* in Puerto Rico.**
Robert John Miller *(robert.miller@ars.usda.gov)[1], Fred Soltero[2], Adalberto A. Pérez de León[3] and Charluz Arocho[4], [1]USDA-ARS, Edinburg, TX, [2]USDA - APHIS, Hato Rey, PR, [3]Knipling-Bushland US Livestock Insect Research Laboratory, Kerrville, TX, [4]USDA ARS Cattle Fever Tick Research Laboratory, Edinburg, TX*

Insects in Food and Feed

Executive Learning Center (Woodward Conference Center)

Moderators and Organizers: Molly Keck[1] and Robert Allen[2], [1]Texas AgriLife Extension Service, San Antonio, TX, [2]Little Herds, Austin, TX

8:00 AM **Introductory Remarks**

8:05 AM 7-1 **Creating a novel global industry with the black soldier fly.**
Jeffery K. Tomberlin *(jktomberlin@tamu.edu), Texas A&M Univ., College Station, TX*

8:25 AM 7-2 **Impact of larval competition on survivorship of the black soldier fly, *Hermetia illucens* (Diptera:Stratiomyidae).**
Brittny Jones *(moonbri_88@tamu.edu) and Jeffery Tomberlin, Texas A&M Univ., College Station, TX*

8:45 AM 7-3 **Rearing insects for innovative feed production: Development of the black soldier fly, *Hermetia illucens* (L.) (Diptera: Stratiomyidae) and house fly, *Musca domestica* (L.) (Diptera: Muscidae) on three manure types.**
Chelsea Holcomb *(chelseaholcomb@tamu.edu) and Jeffery Tomberlin, Texas A&M Univ., College Station, TX*

9:05 AM 7-4 **Using nutrition ecology to build a better black soldier fly.**
Jonthan Cammack *(Jcammack_07@tamu.edu) and Jeffery Tomberlin, Texas A&M Univ., College Station, TX*

9:25 AM **Break**

9:40 AM 7-5 **The impact of larval digestion of different manure types by the black soldier fly , *Hermetia illucens*, (L.) (Diptera: Stratiomyidae) on volatile emissions.**
Kelly Beskin *(kelly.beskin@gmail.com)[1] and Jeffery Tomberlin[2], [1]Texas A&M Univ., College Station, TX, [2]Associate Professor, college Station, TX*

10:00 AM 7-6 **Morphology of the male reproductive tract and sperm of the adult black soldier fly (Diptera: Stratiomyidae): Implication for adult colony maintenance.**
Aline Spindola *(aline.spin@tamu.edu), John D. Oswald and Jeffery Tomberlin, Texas A&M Univ., College Station, TX*

10:20 AM 7-7 **Normalizing entomophagy for the next generation of farmers, chefs and consumers through experiential education.**
Robert Allen *(na@na.com), Little Herds, Austin, TX*

10:40 AM 7-8 **Entomaphagy outreach: Insecta fiesta: Teaching the public that food can come from the smallest places.**
Molly Keck *(mekeck@ag.tamu.edu), Texas AgriLife Extension Service, San Antonio, TX*

11:00 AM **Break 2**

11:15 AM 7-9 **Challenges and opportunities in insect husbandry.**
Mohammed Ashour *(MA@AspireFG.com), Aspire Food Group, Austin, TX*

11:35 AM 7-10 **Assessment of the regulatory framework related to using insects as food and feed.**
Mark Nagy *(Mark@IncredibleFoodsCompany.com), Incredible Foods Company, Forth Worth, TX*

11:55 AM 7-11 **Bridging the urban-rural divide with 'Table to Farm' nutrient upcycling.**
Robert Oliver *(Robert@GrubTubs.com), Grubtubs, Portland, OR*

12:15 PM 7-12 **Buggin' out over edible insects; taking insect-cuisine mainstream.**
Don Peavy *(chefpv@chefdonpv.com), Chef PV, TV host of Buggin' Out, Brooklyn, NY*

12:35 PM 7-13 **Associated bacteria community in black soldier fly (Diptera: Stratiomyidae) larvae shift in response to host starvation.**
Fengchun Yang *(springyang@tamu.edu)[1], Heather Jordan[2] and Jeffery Tomberlin[1], [1]Texas A&M Univ., College Station, TX, [2]Mississippi State Univ., Mississippi State, MS*

Advances in thrips management and the diseases they vector in the Southwestern US

Lady Bird Lake (Woodward Conference Center)

Moderators and Organizers: Steven Arthurs[1] and Kevin Heinz[2], [1]Texas A&M AgriLife, College Station, TX, [2]Texas A&M Univ., College Station, TX

9:00 AM **Introductory Remarks**

9:05 AM 8-1 **Detection and response to emerging thrips-vectored diseases impacting Texas agriculture.**
Steven Arthurs *(sarthurs@tamu.edu)[1] and Kevin Heinz[2], [1]Texas A&M AgriLife, College Station, TX, [2]Texas A&M Univ., College Station, TX*

9:25 AM 8-2 **Evaluating varietal resistance to thrips: Progress from the cotton breeding program on the Texas South Plains.**
Abdul Hakeem *(ahakeem@vols.utk.edu), Jane Dever and Megha Parajulee, Texas A&M AgriLife Research, Lubbock, TX*

9:45 AM 8-3 **An historical overview on thrips/tospovirus management programs in peanut.**
Forrest Mitchell *(f-mitchell@tamu.edu), Texas A&M Univ., Stephenville, TX*

10:05 AM 8-4 **Unique tomato spotted wilt virus strains in the Southwestern US.**
Steve F. Hanson *(shanson@nmsu.edu), New Mexico State Univ., Las Cruces, NM*

10:25 AM **Break**

10:40 AM 8-5 **Systems approach to the management of western flower thrips infesting ornamentals.**
Kevin Heinz *(kmheinz@tamu.edu)[1], Andrew Chow[2], Amanda Chau[3] and Peter Krauter[1], [1]Texas A&M Univ., College Station, TX, [2]Texas A&M Univ., Weslaco, TX, [3]Texas A&M Univ./ Blinn College, Bryan, TX*

11:00 AM 8-6 **Advances in insecticide chemistry as a component to thrips IPM programs.**
Carlos Bogran *(cbogran@ohp.com), OHP Inc., College Station, TX*

11:20 AM 8-7 **Genomic and biological characterization of tomato necrotic streak virus, a novel ilarvirus infecting tomato in Florida.**
Ismael E. Badillo-Vargas *(ismael.badillo@ag.tamu.edu)[1], Joseph E. Funderburk[2] and Scott Adkins[3], [1]Texas A&M AgriLife Research, Weslaco, TX, [2]Univ. of Florida NFREC, Quincy, FL, [3]USDA Agricultural Research Service, Fort Pierce, FL*

WEDNESDAY, APRIL 12, 2017, AFTERNOON

Extension entomologists in action: updates from the field and lessons to build effective extension education programs

Guadalupe (Woodward Conference Center)

Moderators and Organizers: Suhas Vyavhare[1] and Charles Allen[2], [1]Texas A&M AgriLife Extension Service, Lubbock, TX, [2]Texas A&M Univ., San Angelo, TX

12:00 AM **Introductory Remarks**

12:45 PM 9-1 **Updates on insect pests in Texas High Plains cotton.**
Suhas Vyavhare *(suhas.vyavhare@ag.tamu.edu), Texas A&M AgriLife Extension Service, Lubbock, TX*

1:00 PM 9-2 **Efficacy of diamond on bollworms and scheduled diamond applications for cotton yield enhancement in West Texas cotton.**
Blayne Reed *(blayne.reed@ag.tamu.edu), Texas AgriLife Extension, Plainview, TX*

1:20 PM 9-3 **Sugarcane aphid leaf damage leads to significant yield loss and reductions in stalk feed quality.**
Katelyn Kesheimer *(Katelyn.Kesheimer@ag.tamu.edu)[1], Blayne Reed[2], Ed Bynum[3] and Patrick Porter[4], [1]Texas A&M Univ., Lubbock, TX, [2]Texas AgriLife Extension, Plainview, TX, [3]Texas A&M AgriLife Extension, Amarillo, TX, [4]Texas A&M AgriLife Extension, Lubbock, TX*

1:40 PM 9-4 **11.8 million head of cattle in Texas and one livestock entomologist.**
Sonja L. Swiger *(slswiger@ag.tamu.edu), Texas A&M Univ., Stephenville, TX*

2:00 PM 9-5 **Planning for success: keys to an effective extension career.**
Charles Allen *(ctallen@ag.tamu.edu), Texas A&M Univ., San Angelo, TX*

2:20 PM 9-6 **Engaging adult audiences: practices and methods in effective and entertaining outreach.**
Molly Keck *(mekeck@ag.tamu.edu), Texas AgriLife Extension Service, San Antonio, TX*

2:40 PM **Break**

2:55 PM 9-7 **Making a difference: keys to stakeholder adoption of practices.**
Joel Webb *(cjwebb@ag.tamu.edu), Texas A&M Univ., Lubbock, TX*

3:15 PM 9-8 **Building strong programs: keys to effective collaborations.**
Brad Easterling *(breasterling@ag.tamu.edu), Texas A&M Univ., Garden City, TX*

3:35 PM 9-9 **Telling the story: Keys to writing an effective IPM Newsletter.**
Xandra Morris *(Xandra.Morris@ag.tamu.edu), Texas A&M Univ., Hillsboro, TX*

3:55 PM 9-10 **Audience polling made fun – simple solutions to engage your audience.**
Erfan Vafaie *(erfanv@tamu.edu), Texas A&M AgriLife Extension Service, Overton, TX*

4:15 PM 9-11 **Instructional design and video production tools for better educational programs.**
Jason Thomas *(jasonfalc@gmail.com), Texas A&M Univ., College Station, TX*

Public and veterinary health: What is a vector biologist's role

Lady Bird Lake (Woodward Conference Center)

Moderators and Organizers: Justin Talley[1] and Sonja L. Swiger[2], [1]Oklahoma State Univ., Stillwater, OK, [2]Texas A&M Univ., Stephenville, TX

1:00 PM **Introductory Remarks**

1:05 PM 10-1 **Citizen science advances Chagas disease research at the vector-human-animal interface.**
Sarah Hamer *(shamer@cvm.tamu.edu), Texas A&M Univ., College Station, TX*

1:25 PM 10-2 **Stirring the sand in Namibia: A vector biologist's role in a developing country.**
Bruce Noden *(bruce.noden@okstate.edu), Oklahoma State Univ., Stillwater, OK*

1:45 PM 10-3 **The role of academia when Zika hits the fan.**
Gabriel Hamer *(ghamer@tamu.edu), Texas A&M Univ., College Station, TX*

2:05 PM 10-4 **Exploring the ecology & behaviors of ixodid ticks in Oklahoma pastures.**
Trisha Dubie *(trishd@okstate.edu), Oklahoma State Univ., Stillwater, OK*

2:25 PM **Break**

2:40 PM 10-5 **Ever changing challenges to prevent cattle fever tick infestations.**
Pete Teel *(pteel@tamu.edu), Texas A&M Univ., College Station, TX*

3:00 PM 10-6 **A brief overview of the ear tick, *Otobius megnini*.**
David H. Kattes *(kattes@tarleton.edu), Tarleton State Univ., Stephenville, TX*

3:20 PM 10-7 Vector abatement education and surveillance throughout the great state of Texas
Sonja L. Swiger *(slswiger@ag.tamu.edu)[1], Molly Keck[2], Wizzie Brown[3], Michael Merchant[4], Bethany Bolling[5], Tom Sidwa[5] and Scott Weaver[6], [1]Texas A&M Univ., Stephenville, TX, [2]Texas AgriLife Extension Service, San Antonio, TX, [3]Texas A&M Univ., Austin, TX, [4]Texas A&M AgriLife Extension Service, Dallas, TX, [5]Dept. of State Health Services - Texas, Austin, TX, [6]Univ. of Texas Medical Branch, Galveston, TX*

3:40 PM 10-8 Communicating to cattle producers in Oklahoma: Speaking their language to stress the importance of external parasites
Justin Talley *(justin.talley@okstate.edu), Oklahoma State Univ., Stillwater, OK*

Regular Ten-Minute Orals

Executive Learning Center (Woodward Conference Center)

Moderators: Manuel Campos[1] and Scott Longing[2], [1]BioSafe Systems, East Hartford, CT, [2]Texas Tech Univ., Lubbock, TX

1:15 PM Introductory Remarks

1:18 PM 11-1 Effects of varying fire-return interval on terrestrial macro-arthropods in a mesquite-encroached shortgrass prairie: Abundance, diversity, and biomass.
Joy Newton *(newtonj@unce.unr.edu)[1], Richard T. Kazmaier[2] and W. David Sissom[2], [1]Univ. of Nevada, Yerington, NV, [2]West Texas A&M Univ., Canyon, TX*

1:30 PM 11-2 Consider the host plant! Crop variety influences populations of pests and natural enemies
Eric Rebek *(eric.rebek@okstate.edu), Oklahoma State Univ., Stillwater, OK*

1:42 PM 11-3 Natural enemy interactions in winter wheat and canola systems
Casi N. Jessie, **Kris Giles** *(kris.giles@okstate.edu) and William Jessie, Oklahoma State Univ., Stillwater, OK*

1:54 PM 11-4 IPM of the cotton fleahopper in 2017.
Stephen Biles *(biles-sp@tamu.edu)[1], Michael Brewer[2] and Robert Bowling[3], [1]Texas A&M Univ., Port Lavaca, TX, [2]Texas A&M AgriLife Research, Corpus Christi, TX, [3]Texas A&M AgriLife Extension Service, Corpus Christi, TX*

2:06 PM 11-5 Insect pest management in speciality crops using *Beauveria bassiana* and azadirachtin based commercial formulations.
Manuel Campos *(mcampos@biosafesystems.com), BioSafe Systems, East Hartford, CT*

2:18 PM Break

2:33 PM 11-6 The feeding and reproductive behavior of global haplotypes of *Melanaphis sacchari* (Hemiptera: Aphididae).
Greg Wilson *(gregwils@tamu.edu)[1] and David Kerns[2], [1]Texas A & M Univ., Bryan, TX, [2]Texas AgriLife Extension Service, College Station, TX*

2:45 PM 11-7 Population dynamics and management of sugarcane aphid (*Melanaphis sacchari*) in the Texas Panhandle.
Ada Szczepaniec *(ada.szczepaniec@ag.tamu.edu), Texas A&M AgriLife Research, Amarillo, TX*

2:57 PM 11-8 Modeling effects of landscape context on parasitism of cereal aphids in wheat by *Lysephlebus testaceipes.*
Norman Elliott *(norman.elliott@ars.usda.gov)[1], Michael Brewer[2], Kris Giles[3] and Mpho Phoofolo[3], [1]USDA - ARS, Stillwater, OK, [2]Texas A&M AgriLife Research, Corpus Christi, TX, [3]Oklahoma State Univ., Stillwater, OK*

3:09 PM 11-9 Grain protectants available for stored grains.
Edmond L. Bonjour *(edmond.bonjour@okstate.edu), Oklahoma State Univ., Stillwater, OK*

3:21 PM 11-10 Comparison of egg extraction methods for *Bagrada hilaris* (Heteroptera: Pentatomidae).
C. Scott Bundy *(cbundy@nmsu.edu)[1], Melise Taylor[2] and J.E. McPherson[3], [1]New Mexico State Univ., Las Cruces, NM, [2]New Mexico State Univ., Albuquerque, NM, [3]Southern Illinois Univ., Carbondale, IL*

Wednesday Posters

WEDNESDAY, APRIL 12, 2017, POSTERS

Regular poster presentations

Lake Austin (Woodward Conference Center)

P4-1 **An evaluation of management tactics for sugarcane aphid (SA) *Melanaphis sacchari* (Zehntner) in Oklahoma grain sorghum *Sorghum bicolor* (L.), 2016.**
Ali Zarrabi *(ali.zarrabi@okstate.edu)[1], Tom Royer[1], Kris Giles[1], Norman Elliott[2], S. Seuhs[1], Jessica Lindenmayer[1] and Neda Ghousifam[1], [1]Oklahoma State Univ., Stillwater, OK, [2]USDA - ARS, Stillwater, OK*

P4-2 ***Cryptonevra nigritarsis*, (Chloropidae) a shootfly that infests invasive giant reed, *Arundo donax* (Graminae).**
Donald B. Thomas *(donald.thomas@ars.usda.gov) and John A. Goolsby, USDA - ARS, Edinburg, TX*

P4-3 **Fungi isolated from house flies (Diptera: Muscidae) on penned cattle in south Texas with comments on bovine ringworm.**
Cherity Ysquierdo *(cherity.ysquierdo@utrgv.edu)[1], Pia Olafson[2] and Donald B. Thomas[3], [1]The Univ. of Texas Rio Grande Valley, Brownsville, TX, [2]USDA - ARS, Kerrville, TX, [3]USDA - ARS, Edinburg, TX*

P4-4 **Comparative melissopalynology to understand the foraging preferences of *Trigona iridipennis* Smith, from various altitudes of Kerala, India.**
Deepthi T. R *(deepthitrarun@gmail.com)[1] and Mary Painter[2], [1]N S S Hindu College, Kerala, India, Kottayam, India, [2]N S S Hindu College, Kerala, Kottayam, India*

P4-5 **Control of cotton fleahopper with selected insecticides in cotton, 2016.**
Suhas Vyavhare *(suhas.vyavhare@ag.tamu.edu)[1], Adam Kesheimer[1] and Blayne Reed[2], [1]Texas A&M AgriLife Extension Service, Lubbock, TX, [2]Texas AgriLife Extension, Plainview, TX*

P4-6 **Life history and varietal preference of *Erythroneura comes* (Hemiptera: Cicadellidae) in an Oklahoma vineyard.**
Kevin Jarrell *(kevin.jarrell@okstate.edu) and Eric Rebek, Oklahoma State Univ., Stillwater, OK*

P4-7 **Evaluation of a potential new biological control agent of *Bactericera cockerelli.***
Gabriela Esparza-Díaz *(gesparzadiaz@ag.tamu.edu)[1], Raul T. Villanueva[2], Joseph Munyaneza[3], David Horton[3] and Ismael E Badillo[4], [1]Texas A&M Univ., Weslaco, TX, [2]Univ. of Kentucky, Princeton, KY, [3]USDA-ARS, Wapato, WA, [4]Texas A&M AgriLife Research, Weslaco, TX*

P4-8 **Further demonstration of widespread phosphine resistance in *Cryptolestes ferrugineus* (Coleoptera: Laemophloeidae) in Oklahoma.**
Charles Konemann *(charles.e.konemann@okstate.edu), George Opit and Zhaorigetu Hubhachen, Oklahoma State Univ., Stillwater, OK*

P4-9 **Predation of sentinel eggs in cotton and sorghum in New Mexcio.**
Jane Breen Pierce *(japierce@nmsu.edu), Patricia E Monk and John Idowu, New Mexico State Univ., Las Cruces, NM*

P4-10 **Insect pest management in speciality crops using *Beauveria bassiana* and azadirachtin based commercial formulations.**
Manuel Campos *(mcampos@biosafesystems.com), BioSafe Systems, East Hartford, CT*

P4-11 **Responses of blackmargined aphid (*Monellia caryella* (Fitch); Hemiptera: Aphididae) densities to seasonal changes in selected abiotic and biotic factors in pecan.**
Tiffany Johnson *(shimsham@nmsu.edu) and Brad Lewis, New Mexico State Univ., Las Cruces, NM*

P4-12 **Electropenetrography of the mosquito, *Aedes aegypti*, feeding on humans.**
Astri Wayadande *(a.wayadande@okstate.edu) and Bruce Noden, Oklahoma State Univ., Stillwater, OK*

P4-13 **Using a non-majors class to reduce entomophobia and increase entomophilia.**
W. Wyatt Hoback *(whoback@okstate.edu)[1] and Douglas Golick[2], [1]Oklahoma State Univ., Stillwater, OK, [2]Univ. of Nebraska, Lincoln, NE*

P4-14 **Abundance and diversity of sugarcane aphid predators in the Texas panhandle.**
Eva Huff *(eva.huff@ag.tamu.edu) and Ada Szczepaniec, Texas A&M AgriLife Research, Amarillo, TX*

P4-15 **Toxicity of abamectine and buprofezin, on homosigotic lines of *Trichogramma pretiosum* Riley (Hymenoptera: Trichogramatidae) under laboratory conditions.**
Antonio Orozco *(orozco_plancarte@hotmail.com)[1], Omegar Hernández[1], Ernesto Cerna[2], Yisa Ochoa[1], Juan Delgado[1] and Maria Orozco[1], [1]Universidad Autonoma Agraria Antonio Narro, Saltillo, Mexico, [2]Universidad Autónoma Agraria Antonio Narro, Saltillo, Mexico*

P4-16 **Morphometrics of the southern green stink bug stylet bundle.**
Jesus F. Esquivel *(jesus.esquivel@ars.usda.gov)[1], Robert Droleskey[2] and Roger Harvey[2], [1]USDA, ARS, Insect Control and Cotton Disease Research Unit, College Station, TX, [2]USDA, ARS, Food & Feed Safety Research Unit, College Station, TX*

P4-17 **The short term impact of the Las Conchas Fire (2011) on ant communities in the Valles Caldera National Preserve.**
Jonathan Knudsen and **Robin Verble** *(robin.verble@ttu.edu), Texas Tech Univ., Lubbock, TX*

P4-18 **Records of western bean cutworm, *Striacosta albicosta*, as a primary pest of corn ears in Mexico.**
Sergio Sanchez-Peña *(sanchezcheco@gmail.com)[1], Moises Felipe-Victoriano[2], Renato Villegas-Luján[2] and Esmeralda Gonzalez-Gallegos[2], [1]Universidad Autónoma Agraria Antonio Narro, Saltillo, Mexico, [2]Universidad Autonoma Agraria Antonio Narro, Saltillo, Mexico*

P4-19 **Laboratory bioassays of entomopathogenic fungi against *Melanaphis sacchari.***
Karla Cruz-Aldaco *(aldacokarla@gmail.com)[1], Gabriela Esparza-Díaz[2], Raul T. Villanueva[3], Richard Humber[4] and Sergio Sanchez-Peña[1], [1]Universidad Autónoma Agraria Antonio Narro, Saltillo, Mexico, [2]Texas A&M Univ., Weslaco, TX, [3]Univ. of Kentucky, Princeton, KY, [4]USDA - ARS, Ithaca, NY*

P4-20 **Spotted alfalfa aphid (SAA) control: A look at conventional vs. unconventional products.**
S. Seuhs *(k.seuhs@okstate.edu)[1], Ali Zarrabi[1], Audrey Arant[2], Jenna Tuggle[2], Anna Hammons[2], Maggie Edwards[2], Kylie King[2] and Phillip G. Mulder[1], [1]Oklahoma State Univ., Stillwater, OK, [2]Oklahoma School of Innovation and Experiential Learning, Bixby, OK*

P4-21 **Cotton fleahopper management under varying irrigation water levels in the Texas Southern High Plains.**
Megha Parajulee *(m-parajulee@tamu.edu), Texas A&M AgriLife Research, Lubbock, TX*

P4-22 **Evaluation of thrips damage potential in Texas Southern High Plains cotton.**
Abdul Hakeem *(abdul.hakeem@ag.tamu.edu)[1] and Megha Parajulee[2], [1]Texas AgriLife Research, Lubbock, TX, [2]Texas A&M AgriLife Research, Lubbock, TX*

Oral Abstracts

Student Ten-Minute Paper Competition

Student Competition: Undergraduate Ten-Minute Papers

1-1. Age-dependent variation of vitellogenin transcripts in male fire ants (*Solenopsis invicta).*

Colin Roper (razmonk@tamu.edu), Chloë Hawkings and Cecilia Tamborindeguy, Texas A&M Univ., College Station, TX

After its introduction to the USA in 1930, the red imported fire ant (*Solenopsis invicta*) has become an increasingly significant medical, agricultural and economical pest, and there is an urgent need to find novel pest control strategies. Insect vitellogenins (Vg) are large glycolipoproteins typically involved in vitellogenesis. Studies have also shown that vitellogenin is also involved in social function in the honey bee (*Apis Mellifera*). The genome of *Solenopsis invicta* harbors 4 distinct vitellogenin genes, Vg1, Vg2, Vg3 and Vg4 (Wurm et al. 2011). The distinct functional component of vitellogenin in males has been subject to investigation. Our laboratory has shown the expression of vitellogenins in males, queens and sterile workers both at a transcriptional and protein level. The characterization of expression patterns in fire ants could provide novel targets for control strategies. This study investigates the age-dependent variation of vitellogenin expression in males to potentially suggest a new functional role in the expression of males. Males were taken at pupae, then 1, 2 and 3 days after pupation and the Vg expression was analyzed through RT-qPCR analysis.

1-2. Assessing the importance of blow flies *(Cochliomyia macellaria)* as potential pollinators in our ecosystem.

Emily Hildinger (yellow17@tamu.edu), Pierre Lau, Juliana Rangel, Vaughn Bryant and Aaron Tarone, Texas A&M Univ., College Station, TX

Blowflies (Diptera: Calliphoridae) are known to forage on carrion and feces for protein. Female flies need to consume a protein meal prior to oviposition, particularly to allow for oocyte maturation. Blow flies have been found to carry pollen grains on their bodies, which has led some to suspect them as capable pollinators in ecosystems. Recent studies suggest that female blow flies can fully develop their oocytes through pollen intake alone. However, it is not known whether they ingest as a nutritional source of protein to use during reproduction with the intended purpose of increasing their fecundity or simply as facultative ability. The goal of this project is to understand whether blow flies are indeed providing pollination services as they forage for pollen sources in natural ecosystems. To do this, colonies of *Cochliomyia macellaria* were reared in a laboratory setting and were later collected after they were given the opportunity to ingest pollen as a protein source. Also, blow flies from rural environments were collected with chicken liver bait from a location in the College Station, TX area. The midguts of sampled blow flies were dissected from each individual and processed with acetolysis for pollen identification. Our preliminary results show that pollen grains from the plant families Asteraceae, Ulmaceae, Poaceae, Saliaceae, Oleaceae, Rhamnaceae, Anacardiaceae, and Myrtaceae families have been consistently identified in the midguts of dissected specimen. This suggests that blow flies do ingest pollen grains as part of their diet and thus could be important pollinators in our local ecosystem.

1-3. Assessing the sublethal effects of bifenazate on honey bee (*Apis mellifera* L.) sucrose response thresholds.

Olalekan Falokun (falokun@tamu.edu)[1], Adrian Fisher II[2], Pierre Lau[2], Julie Mustard[3], Makaylee Crone[1] and Juliana Rangel[2], [1]Texas A&M Entomology, College Station, TX, [2]Texas A&M Univ., College Station, TX, [3]The Univ. of Texas Rio Grande Valley, Brownsville, TX

Honey bees contribute approximately $17 billion annually in pollination services for several major food crops in the United States. Each year, approximately 1.78 million colonies are sent to California to pollinate 800,000 acres of almond groves. Almond growers face challenges to crop productivity due to several pests and pathogens, which are often addressed with a multitude of chemical applications. As a result, honey bees are inadvertently exposed to the chemicals that are applied in the field. One example is Bifenazate, an acaracide that is commonly applied in almond orchards to control spidermites. The mode of action has recently been suggested to be an inhibitor of mitochondrial electron transport. Prior to this finding, Bifenazate was thought of to be a neurotoxin. However, its effect remains largely unknown.

In this study, we used the proboscis extension reflex (PER) assay to test the effects of Bifenazate on honey bee sucrose response thresholds. Honey bees were placed in a flight tunnel and exposed to field relevant concentrations of Bifenazate. This method simulates the field relevant conditions of a foraging worker as aerial applications of Bifenazate are applied in the almond grove. The foragers were then mounted on harnesses and tested for their sucrose responsiveness 24 hours and 48 hours after their initial exposure to Bifenazate. Our working hypothesis for this study is that bees exposed to Bifenazate will have a significantly higher sucrose response threshold compared to the control treatment. This study provides further insight on how Bifenazate affects honey bee foraging behavior.

1-4. Bigger not better: Smaller carrion sizes positively correlate with fly production.

Victoria Pickens (vpicken@ostatemail.okstate.edu)[1] and W. Wyatt Hoback[2], [1]Oklahoma State Univ., Stilwater, OK, [2]Oklahoma State Univ., Stillwater, OK

Numerous organisms compete for the resources in deceased vertebrates, flies being among the first to arrive and most important to decomposition. To characterize the relationship between carcass size and fly production, we arranged four replicates of 10 different whole mammals by their average mass using immature rats, mice, small , medium , large, XL and XXL rats, and medium, large, and XL rabbits. Each body was placed into a container with about 3 cms of sand and left in the environment for 8 hours to allow flies to oviposit. Following the 8 hours, adult flies were removed, lids were placed on the containers, and the containers were taken to a research lab. Fly larvae hatched and when they reached pupa, were counted. Approximately 50 pupae per specimen were allowed to emerge for identification. A total of 104,622 pupae were collected belonging to the families Calliphoridae and Phoridae. A positive correlation between the number of pupae and the animal mass (r^2= 0.937) existed up to the largest carcasses, which had fewer pupae. The lack of a relationship between larger carcasses and fly number may be a result of the containers used or may reflect the larger volume of carcasses being inaccessible to flies until the later stages of decay. Overall, these data provide the first controlled and replicated assessment of carcass size on the number of flies produced. These relationships are important for assessing the influence of carcasses in an environment on the number of flies capable of disease transmission to humans and livestock.

1-5. Controlling aphid populations in daylily crops using green lacewings *(Chrysoperla rufilabris).*

Bret Nash (Bret2012@tamu.edu), Texas A&M Univ., College Station, TX

Objective: To reduce the population of several species in the family Aphididae using biological control methods.

Background: This project was set up to reduce the number of Aphids of various species from the flowering plants known commonly as Daylilies. This set of experiments was carried out to limit the rapid expansion of aphid popultions that had been seen at a local daylily nursery. Chemical treatment for aphids around daylilies proves difficult due to the crop being susceptible to damage by various insecticides on the market, can have residual effects on butterflies, and is not economically viable as a control option based upon returns. The species Chrysoperia rufilabris is a readily available species, at a relatively low cost. The owner had several areas that she keeps her crops, with a considerable distance between them, so it provides an opportunity to compare treated versus non treated crops using this biological control. It was noted by several distributors that prior control of Solenopsis invicta was recommended as these fire ants will tend and protect the aphids for their honeydew. Measures were taken for this and the experiment data was conducted.

1-6. Density-dependent phenotypic plasticity in *Schistocerca lineata* Scudder, 1899 (Orthoptera: Acrididae).

Shelby Kilpatrick (entorocks527@tamu.edu), Bert Foquet and Hojun Song, Texas A&M Univ., College Station, TX

Locusts show an extreme form of density-dependent phenotypic plasticity known as locust phase polyphenism. Recent studies show that sedentary species related to locusts also exhibit some levels of density-dependent phenotypic plasticity. The spotted bird grasshopper, *Schistocerca lineata* Scudder, 1899 (Orthoptera: Acrididae), is widely distributed throughout North America. Populations of *S. lineata* have been found to be highly variable in coloration with at least four different known ecotypes. In Texas, the aposematic, or warning coloration, *S. lineata* ecotype feeds primarily on the toxic plant *Ptelea trifoliata* L., 1753 (Sapindales: Rutaceae) and derives chemical defense as a result. Individuals of this ecotype are bright yellow in color with striking blue eyes. *Schistocerca lineata* has previously been shown to exhibit density-dependent phenotypic plasticity, however the level density-dependent phenotypic plasticity that they exhibit has never been formally quantified. Here, we test the hypothesis that *S. lineata* nymphs reared from their first to sixth instar in either isolated or crowded conditions exhibit differences in their behavior, morphology, and color. The behavior, morphology, and color of individual *S. lineata* nymphs from each rearing condition was recorded, measured, and analyzed. Contrary to the previous report, we find no evidence of density-dependent phenotypic plasticity in *S. lineata*. Therefore, the threshold for sensing density appears to be very low for this species. It is probable that phenotypic plasticity in *S. lineata* is mediated by factors other than density, such as chemicals or other environmental stimuli, and further research is necessary to elucidate the components acting in this complex system.

1-7. Evaluating various insecticide baits against multiple house fly (Diptera: Muscidae) strains under laboratory conditions.

Ramon Zepeda (rz@nmsu.edu) and Brandon Smythe, New Mexico State Univ., Las Cruces, NM

Developing successful house fly (*Musca domestica*) control in animal production facilities is critical for producers to avoid animosity and potential litigation from neighboring communities. Various management options are available to producers aimed at controlling house fly populations. However, overreliance on insecticidal based tools and a failure to integrate additional pest control options often leads to increased expressions of resistance in field populations. Insecticidal baits routinely are used as premise treatments to decrease direct animal exposure to active ingredients. A recently developed, commercially-available insecticide bait with a new mode of action using the active ingredient Cyantraniliprole, is available under the registered name, Zyrox® Fly. Consequently, the number of insecticide based tools available for producers have broadened. The objective of this study was to evaluate the efficacy of various insecticidal baits labeled for house fly control using choice and no-choice bioassays under laboratory conditions. A susceptible house fly colony was used to generate baseline data for comparisons to field strains collected from Florida, New Mexico, and California. Female house flies from each strain were exposed to Golden Marin (1.0% Methomy, GM), QuickStrike® (0.5% Dinotesuran, QS), Quick Bayt® (0.5% Imidacloprid; QB), Elector (0.5% Spinosad; EL) and Zyrox®Fly (0.5% Cyantraniliprole; ZF) fly baits at label rates within individual evaluation chambers for each assay type. Comparisons between mortality of house fly strains within each insecticidal bait was evaluated. Mortality was decreased ($P < 0.05$) for all field strains when compared to susceptible house flies following exposure. The implications of these findings will be discussed.

1-8. Fire ant (*Solenopsis invicta*) interactions with green milkweed (*Asclepias viridis*) insect communities.

Payal Patel (ppatel14@austincollege.edu), Sydney Jackson and Loriann Garcia, Austin College, Sherman, TX

The red imported fire ant (*Solenopsis invicta*), is an invasive species in the southern United States. How these ants affect plant and insect communities in prairie ecosystems is largely unknown. Here, we investigate the interactions between fire ants and other members of a Blackland prairie community in north Texas: green milkweed (*Asclepias viridis*) and milkweed aphid (*Aphis nerii*). We first measured the milkweed density and the density of fire ants mounds at the Clinton and Edith Sneed Prairie Restoration Site (Grayson Co. TX). Then we monitored the frequency of fire ant-milkweed aphid interactions and conducted manipulative experiments to determine how fire ants affect pollinator visits to green milkweed. Our results show that there was an abundance of milkweed at Sneed Prairie, specifically non-reproductive and seed pod milkweed in June 2016. In addition, fire ants were frequently found foraging on milkweed flowers, but there was a limited amount and ant-aphid interactions present at the time of data collection. There was also a limited number of pollinator visits to milkweed, regardless of ant presence or absence in our manipulative experiment. In future investigations we will study how nectar robbing by fire ants may affect monarch butterfly populations in north Texas.

1-9. The effects of pyriproxyfen exposure on honey bee (*Apis mellifera*) sucrose sensitivity.

Makaylee Crone (makaylee.crone22@tamu.edu)[1], Olalekan Falokun[1], Adrian Fisher II[2], Pierre Lau[2], Julie Mustard[3] and Juliana Rangel[2], [1]Texas A&M Entomology, College Station, TX, [2]Texas A&M Univ., College Station, TX, [3]The Univ. of Texas Rio Grande Valley, Brownsville, TX

In the United States, the honey bee (*Apis mellifera*L.) contributes over $16 billion in pollination services annually. Among the major beneficiaries, almonds are entirely dependent on honey bees for pollination. Almond growers face challenges to crop productivity due to several pests and pathogens which are often addressed with a multitude of chemical applications. For instance, insecticides are often applied in combination with other products to control pests. Over 60% of all managed bee hives are brought to almond orchards in California during almond bloom, potentially exposing them to simultaneous chemical applications.

To assess the effect of pyriproxyfen used during almond bloom on honey bee forager sucrose sensitivity, we collected foragers from a local apiary and exposed them to the label dose, or a range of dose variants (from 0.5 to 3x the label dose). We utilized a wind tunnel and atomizer set up (wind-speed: 2.9 m/s) to simulate field-relevant exposure of honey bees to pyriproxyfen during aerial application in almond orchards. Exposed foragers and a control group were subdued by cold temperature and transferred individually to plastic straw harnesses. We then measured sucrose sensitivity using proboscis extension reflex (PER) at intervals 24 and 48 hours after exposure. Sucrose sensitivity was assessed by observing whether or not there was a stimulation of PER following the offer of differing concentrations of sucrose solution. After our trials are completed we expect to observe a significant decrease in forager sucrose sensitivity resulting from exposure to the insecticide pyriproxyfen.

Symposia

SYMPOSIUM: Current trends in social insect biology

2-1. Success of young ant colonies: Using experimental transplants to understand growth and survival.

Blaine J. Cole (bcole@uh.edu), Univ. of Houston, Houston, TX

The factors responsible for variation in the fitness of ant colonies are a subject of considerable interest and importance. One of the critical stages in colony development are small colonies which are often vulnerable due to the risk of starvation, predation and interactions with aggressive neighbors. In order to investigate the effects of intrinsic colony properties and environmental factors on the success of young colonies we constructed colonies of ants with directed matings and then transplanted colonies to selected sites. I will present data on the survival of *Pogonomyrmex occidentalis* harvester ants as a function of food addition, mating frequency and site properties.

2-2. Intracolony transmission of the microsporidian pathogen (*Myrmecomorba nylanderiae*) and its impact upon the growth of tawny crazy ant (*Nylanderia fulva*) colonies.

Ed LeBrun (edwardlebrun@austin.utexas.edu)[1], Kristina Ottens[2] and Lawrence E. Gilbert[1], [1]The Univ. of Texas, Austin, TX, [2]The Univ. of Iowa, Iowa City, IA

The discovery of the microsporidian pathogen *Myrmecomorba nylanderiae* infecting introduced tawny crazy ants (*Nylanderia fulva*) represents one of the first natural enemies reported attacking this invasive ant. We assess how infection is transmitted within colonies and how infection impacts *N. fulva* colony fragment growth under carbohydrate-deficient and carbohydrate-sufficient dietary conditions. Carbohydrate scarcity is a common source of stress for ant colonies. Infected workers efficiently pass infection to developing larvae. All other potential pathways for within colony transmission appear either non-viable or rare and of low functional importance. For unknown reasons, queens within infected nests are generally uninfected, limiting the importance of transovarial transmission or other pathways involving queens. In the laboratory, infection by *M. nylanderiae* impacts *N. fulva* colonies through a reduction in larval developmental success. No other traits were impacted by infection. Virulence was substantially larger under carbohydrate-deficient than carbohydrate-sufficient conditions. Dependency of virulence upon carbohydrate access implies that infection by *M. nylanderiae* may not meaningfully impact colony growth when sugar resources are abundant. By contrast, infected nests should decline relative to uninfected nests when carbohydrates are scarce, such as during winter or drought. Some established *N. fulva* populations have declined precipitously in abundance and have had a high prevalence of *M. nylanderiae* infection prior to their decline. It is unknown *M. nylanderiae* is a causative agent in these declines. The combination of chronic impacts, presence in North America, and potential association with population declines makes *M. nylanderiae* an important prospect for the biological control of *N. fulva*.

2-5. What can experimental mating tell us about the evolution of polyandry in ants?

Diane Wiernasz (dwiernasz@uh.edu), Univ. of Houston, Houston, TX

Several groups of social insects characteristically have high levels of multiple mating by the colony's single queen. In several cases, high mating frequency is associated with higher colony fitness, either through higher performance of colony tasks or by being more resistant to infectious diseases. However, in all such species, considerable variation in queen mating frequency exists. Such variation may be maintained by balancing selection, but may also be produced by variation in traits that involve the mating behavior of male and female reproductives. Previous work has shown that in the western harvester ant, *Pogonomyrmex occidentalis*, male mating success is correlated with both size and shape. We have used experimental mating of *P. occidentalis* to ask whether females from different colonies vary in their propensity to mate and does this variation lead to variation in mating frequency. We conducted mating experiments that used sequential mass mating, single mating and simultaneous mass mating to address these questions.

2-6. Influence of queens on the foraging behavior of *Nylanderia fulva* and *Solenopsis invicta.*

Pierre Lesne (pierre.lesne@exchange.tamu.edu)[1], Audrey Dussutour[2] and Spencer T. Behmer[1], [1]Texas A&M Univ., College Station, TX, [2]Universite Paul Sabatier, Toulouse, France

The United-States has witnessed successive invasions of exotic species that dramatically reduced biodiversity and made ecosystems more susceptible to new invasions. The recent introduction of the tawny crazy ant (*Nylanderia fulva*) in Texas and its interaction with the previously established red imported fire ant (*Solenopsis invicta*) is a remarkable opportunity to understand the mechanisms involved in the competition between two exotic species in an invasive range. Unicoloniality and high polygyny are essential features of the invasive potential of numerous ant species. These traits are more developed in *N. fulva* and might be decisive in its interaction with *S. invicta* by reducing intraspecific competition over resources and providing fast colony growth. However, the impact of queens on the nutritional physiology of colonies and the collective behaviors associated with nutrient regulation have been largely overlooked. To fill this gap, we here developed a comparative study of the influence of queens on the foraging behavior of *S. invicta* and *N. fulva* workers. Our results show that the presence of queens directly influences the behavior of *N. fulva* workers but that only the development of larvae triggers such behavioral shifts in *S. invicta*. This result suggests the existence of different signals used by the workers to evaluate colony nutritional needs and may have an important impact on the outcome of the competition between these two invasive species.

2-7. Beyond the big easy: Reconstructing the global invasion history of the termite *Reticulitermes flavipe.*

Edward Vargo (ed.vargo@tamu.edu)[1], Elfie Perdereau[2], Franck Dedeine[3] and A. G. Bagnères[4], [1]Texas A&M Univ., College Station, TX, [2]Universite de Tours, Tours, France, [3]National Center for Scientific Research, Tours, France, [4]Univ. de Tours, Tours, France

The subterranean termite, *Reticulitermes flavipes*, is native to North America. In its native range, it is widely distributed in the central and eastern U.S.A. where it plays a significant ecological role as a decomposer of cellulose and is a major pest of human built structures. It has been introduced to many locations in the world where it attacks buildings, including France, Chile, Uruguay, Canada and the Bahamas. To understand the invasion history of this species, we sampled termites from throughout its native and introduced range and applied three sets of molecular genetic markers: mitochondrial DNA sequence data (cytochrome oxidase I gene), microsatellite genotypes (15 loci) and single-nucleotide polymorphisms (SNPs; >13,000 loci). All three sets of markers are consistent in pointing toward the source of the French populations being New Orleans, Louisiana, a result also supported by the similarity of the breeding structure of colonies in New Orleans and in France. In addition, the SNP markers suggested that New Orleans was the likely source of several other introduced populations including the Bahamas, Germany, one population in Canada, and possibly the Chilean population. Thus, New Orleans seems to have served as a source of introduced populations around the world on multiple occasions.

2-8. Metabolic gas emissions by termites on a tallgrass prairie.

Charles Konemann (charles.e.konemann@okstate.edu) and Brad Kard, Oklahoma State Univ., Stillwater, OK

Termites have been shown to produce significant amounts of the metabolic gases, carbon dioxide (CO_2) and methane (CH_4), from the digestion of cellulose. The best described gas emissions have been studied in mound building termites of Australia and Southeast Asia, but metabolic gases from subterranean termites like *Reticulitermes flavipes* Kollar, in natural settings have not been well described due to their cryptic nature in soil. To better understand *R. flavipes* metabolic gases, we designed two experiments: first, a laboratory test to determine the relationship between metabolic gases and population size, as well as a field experiment on the Oklahoma Tallgrass Prairie Preserve to determine if gases produced from *R. flavipes* could be distinguished from normal background soil CO_2 and CH_4. Results from our first test demonstrated a linear relationship between metabolic gases emitted and size of population. Results from field tests showed significant amounts of CO_2 and CH_4 when termites were present compared with normal background soil gases. Further research is needed to examine the dynamics between *R. flavipes* and soil to better understand their metabolic gas emissions.

2-9. Genetic composition and *Nosema* spp. infection levels in feral and managed honey bee (*Apis mellifera*) colonies in Southwestern PA.

Juliana Rangel (jrangel@tamu.edu)[1], Brenna E. Traver[2], Christopher Garza[3], Alejandra Gonzalez[1], Brian Trevelline[4], Thomas D. Seeley[5] and John Wenzel[6], [1]Texas A&M Univ., College Station, TX, [2]Penn State Schuylkill, Schuylkill Haven, PA, [3]Houston Arboretum and Nature Center, Houston, TX, [4]Duquesne Univ., Pittsburgh, PA, [5]Cornell Univ., Ithaca, NY, [6]Carnegie Museum of Natural History, Rector, PA

Among the major challenges to honey bee health is disease caused by the microsporidian gut pathogens *Nosema apis* and *N. ceranae*. Few studies have compared the levels of *Nosema spp*. between feral and nearby managed colonies. To answer this question, we sampled colonies in 2014 and 2015 in a region of southwestern Pennsylvania surrounded by pastures and woodlands across 900 mi^2. Using qPCR to measure DNA copy numbers from 10 individuals per colony, we measured *Nosema spp.* levels from 22 feral and 11 nearby managed colonies as indicators of colony health. Average *N. ceranae* levels were 6.6 X 10^7 ± 3.3 X 10^7 spores/bee in feral colonies and 1.6 X 10^7 ± 9.5 X 10^6 spores/bee in managed colonies, with the percent of bees infected as 48.3% and 47.1% for feral and managed colonies, respectively. Average *N. apis* levels were 2.3 X 10^3 ± 2.2 X 10^3 spores/bee in feral colonies and 8.7 X 10^3 ± 2.9 X 10^3 spores/bee in managed colonies, with the percent of bees infected as 2.1% and 14.3% for feral and managed colonies, respectively. The prevalence of *Nosema* spp. Infection is lower in feral colonies, suggesting they are less prone to nosemosis than managed colonies.

2-10. Haemolymph glucose flux is important for long-term memory formation in the honey bee (*Apis mellifera*).

Nicola Simcock (Nicola.Simcock@newcastle.ac.uk)[1], Geraldine A. Wright[1], Sofia Bouchebti[2] and Helen Gray[3], [1]Newcastle Univ., Newcastle upon Tyne, United Kingdom, [2]Paul Sabatier Univ. - Toulouse III, Tolouse, France, [3]Newcastle Univ., Newcastle Upon Tyne, United Kingdom

Being able to learn and remember information associated with food is vital for all animals and subsequently, nutrient associated stimuli enhance learning and memory. We know that during learning the consumption of metabolisable sugars improves the formation of long term memories, but few have addressed whether the timing and type of sensory input, relative to post-ingestive signalling, is important. In this study we trained honeybees in two olfactory conditioning tasks known to affect memory formation to test how the schedule of reinforcement and the nature of a sugar reward affected learning and memory. Bees could learn both tasks when rewarded with high concentrations of sucrose, glucose or fructose, but only bees rewarded with glucose or sucrose formed robust long-term memory. By measuring the flux in haemolymph sugars, we identified that honeybees fed with glucose or sucrose had a surge in haemolymph glucose >120 mM within 150 s, that remained elevated for as long as 20 min after a single feeding event. Our data demonstrate that bees, like mice, require glucose as a substrate for long-term memory and imply that memory formation depends on the timing of sensory input relative to a flux in blood glucose caused by the consumption of metabolically valuable food.

2-11. Artificial selection on beneficial gut microbiomes of bees.

Ulrich G. Mueller (umueller@austin.utexas.edu)[1], Rong Ma[1], Peter Graystock[2] and Quinn McFrederick[2], [1]The Univ. of Texas, Austin, TX, [2]Univ. of California, Riverside, CA

We adapted host-microbiome co-propagation methods to artificially select for beneficial gut-microbiomes of honey bees, bumble bees, and other insects. Under differential microbiome propagation (i.e., artificial selection on microbiomes), bee phenotypes are used as probes to gauge and manipulate those microbiome functions that impact bee fitness; undesirable microbiomes are eliminated from propagation to the next generation of newly-emerged bees; whereas those microbiomes that impart the most desirable benefits to bees are preferentially perpetuated to the next generation of bees. We used this method to engineer microbiomes that provide pesticide-detox to honey bees and bumble bees. In controlled laboratory experiments, we find that it takes only 2-3 rounds of differential microbiome propagation to generate microbiomes that significantly increase survivorship of bees stressed with pesticides. The same microbiome-selection methods can be used to improve and elucidate any other microbiome function (e.g., protection against disease; enhanced immunity; improved nutrition) of honey bees, bumble bees, or other social and non-social insect.

2-12. Antibiotic exposure perturbs the gut microbiota and elevates mortality in honey bees (*Apis mellifera*).

Kasie Raymann (kraymann86@gmail.com), Zack Shaffer and Nancy Moran, Univ. of Texas at Austin, Austin, TX

Gut microbiomes play crucial roles in animal health, and shifts in the gut microbial community structure can have detrimental impacts on hosts. In apiculture, antibiotics are frequently used to prevent bacterial infections of larval bees, but the impact of antibiotic-induced microbial imbalance on bee health and susceptibility to disease has not been fully elucidated. Here we evaluated the effects of antibiotic exposure on the size and composition of honeybee gut communities. We monitored the survivorship of bees following antibiotic treatment in order to determine if dysbiosis of the gut microbiome impacts honeybee health, and we performed experiments to determine whether antibiotic exposure increases susceptibility to infection by opportunistic pathogens. Our results show that antibiotic treatment has persistent effects on both the size and composition of the honeybee gut microbiome. Antibiotic exposure results in decreased survivorship, both in the hive and in laboratory experiments in which bees were exposed to opportunistic bacterial pathogens. Together, these results suggest that dysbiosis resulting from antibiotic exposure affects bee health, in part due to increased susceptibility to ubiquitous opportunistic pathogens. Not only do our results highlight the importance of the gut microbiome in honeybee health, but they also provide insights into how antibiotic treatment affects microbial communities and host health.

Student Ten-Minute Paper Competition

Student Competition: Ph.D. Ten-Minute Papers

3-1. Bacterial community diversity of *Solenopsis invicta* Buren according to colony, ecoregion, and functional category.

Elida Espinoza (ellyspnz@gmail.com)[1], Tawni L. Crippen[2], Roger Gold[1], Aaron Tarone[1] and Jeffery Tomberlin[1], [1]Texas A&M Univ., College Station, TX, [2]USDA - ARS, College Station, TX

Social interactions, population structure, and the environment of animals regulate associated bacterial communities. Determining the structure of insect bacterial communities could lead to further ecological integration and knowledge of the biotic factors that influence insect behavior, physiology, and life history. In this study, we used next generation sequencing of the 16S rRNA gene v4 hypervariable region to explore the bacterial community of *Solenopsis invicta* Buren at the functional category, colony, and ecoregion levels to compare bacterial species associated with ant biology and behaviors leading to their survival. Specifically asking, how do *S. invicta* bacterial communities differ in alpha and beta diversity, by various metrics/indices, among functional categories and between colonies in four ecoregions? Inherent to eusocial insect biology is the altruistic and communal behaviors, which in part led to the success of these species in the disturbed habitats, such as those created in human environments. *S. invicta* serves as a model of an invasive eusocial species occurring throughout a wide range of diverse ecological regions. We found that diversity indices of the bacterial communities differed between ecoregions, but more significantly across functional groupings. Such differences could impact ant community structure across populations and result in selection for greater success in these contrasting habitats.

3-2. The influence of brood on transcriptional variation in the worker brain of the red imported fire ant (*Solenopsis invicta*).

Chloë Hawkings (chloe.hawks@tamu.edu) and Cecilia Tamborindeguy, Texas A&M Univ., College Station, TX

The red imported fire ant (*Solenopsis invicta*) was introduced to the USA in 1930 and has since become an increasingly significant medical, agricultural, and economic pest. There is an urgent need to find novel pest control strategies. Analyzing the transcriptional data of the worker brain during task allocation and in each worker polymorphism (major, medium and minor) could give insight to genes of significant importance, key in understanding gene networks and interactions important for fire ant colony survival. Studying conditions in the presence or absence of brood could provide knowledge on the gene signaling systems in fire ant colonies in regards to the brood. Transcript data were analyzed from brain samples of morphologically distinct sub-caste workers with specific task allocations, while in the presence or absence of brood. This study particularly focused on the analysis of differentially expressed genes between colonies with and colonies without brood which was carried out using the Tuxedo Suite through Galaxy. No significantly differential genes (p=0.05) were identified in minor ants between brood and no brood colonies. While the comparison between medium workers identified 13 differentially expressed gene (p=0.05) between those from brood and no brood colonies, and the comparison between major workers identified 36 differentially expressed genes (p=0.05) between brood and no brood. Two vitellogenin genes, Vg2 and Vg3 were identified as differentially expressed, with higher expression in the colonies without brood. The expression of these genes was verified using RT-qPCR.

3-3. Arthropod composition of pitfall traps containing non-target vertebrates.

Britt Smith (britt.smith@ttu.edu) and Robin Verble, Texas Tech Univ., Lubbock, TX

Pitfall traps are a common method for examining ground-dwelling arthropod communities. The capture of non-target vertebrate animals may influence arthropod composition. Change in composition may be due to decaying vertebrates or other odors from the vertebrates themselves. We examined pitfall traps from 2014 and 2015 that contained non-target vertebrates. Our study sites are located in the mixed-grass mesquite rangelands of North-Central Texas, and our original goals were to examine the influence of prescribed rangeland fire on ground-dwelling arthropods. Non-target vertebrates included skinks, toads, and small mammals. Pitfall traps consisted of 532ml cups buried flush to the soil surface and contained a 1:1 mixture of water and propylene glycol with a drop of dish detergent to break the surface tension. Traps were collected every 3-5 days. Trap arrays consisted of five traps along a 100m transect. Across the two years, we had 12 replicates located on two private ranches and one wildlife management area. We are currently in the final stages of pitfall trap processing and will soon be analyzing the results using model-based multivariate methods.

3-4. Assesment of single trap sampling of the American burying beetle (*Nicrophorus americanus*) for estimation of population density in Southeast Oklahoma.

Kris Giles and **Kyle Risser** (kyle.risser@okstate.edu), Oklahoma State Univ., Stillwater, OK

Burying beetles in the genus *Nicrophorus* are carrion feeding beetles that display cooperative brood care behavior. Historically, the American Burying Beetle (ABB) (Olivier) (Coleoptera; Silphidae) was found across the eastern United States but is currently limited to three viable populations: Southeast OK, Block Island, RI, and Central NE. Traditionally, density of ABB populations has been calculated using single traps to sample large areas. In this study we evaluated the success of a single trap to accurately estimate population density by comparing single trap captures to larger grid captures within the same habitat type nearby.

3-5. Behavioral and molecular mechanisms of pheromone transmission in honey bees (*Apis mellifera*).

Rong Ma (rong.ma@utexas.edu)[1], Gabriel Villar[2], Christina M. Grozinger[2] and Juliana Rangel[3], [1]The Univ. of Texas, Austin, TX, [2]Pennsylvania State Univ., Univ. Park, PA, [3]Texas A&M Univ., College Station, TX

Chemical cues are ubiquitous and are fundamental to the understanding of a diverse range of biological processes. Honey bees have a complex, nuanced pheromonal language for coordinating changes in physiology and behavior. In the context of cooperative brood care, honey bee larvae produce two sets of pheromones—brood pheromone and (E)-beta-ocimene—that elicit an increase in brood care and foraging activity. Since brood care and foraging behaviors are performed by mutually exclusive groups of workers, we tested how these two pheromones are transmitted throughout the colony and processed in the worker brain.

Combining neurobiology and behavior, this series of experiments provides evidence for the transmission mode of two distinct sets of pheromones in honey bee colonies. Our data support the hypothesis that larval signals target multiple worker types and reveal molecular mechanisms involved in pheromone-influenced food preference.

3-6. Boll weevil (*Anthonomus grandis*) population genomics as a tool for monitoring and management.

Tyler Raszick (tjraszick@gmail.com), Texas A&M Univ., College Station, TX

Despite the success of eradication efforts across most of the cotton-producing regions of the U.S., the cotton boll weevil (*Anthonomus grandis grandis* Boheman) remains a major pest of cotton in much of the New World. The area along the Texas border with northern Mexico has been a particularly troublesome area for eradication efforts due to political and environmental constraints, and the fact that the region is the northern edge of the weevil's natural sub-tropical range. In order to improve boll weevil eradication efforts, we have developed a robust population genomics approach to determine the genetic relationships and patterns of gene flow among weevil populations along the Texas-Mexico border. This approach enables identification of source populations for potential re-introductions in previously eradicated areas and helps guide control measures to reduce or prevent future re-infestations. Using double digest restriction site-associated DNA sequencing (ddRADseq), we generated 6901 SNP markers for 48 individual weevils from four major cotton-growing regions in northern and central Mexico, and from a domestic population in southern Texas. Here, we present the analysis and interpretation of this dataset and make recommendations to management.

3-7. Characterization of the sugarcane aphid microbiome.

Jocelyn R. Holt (holtjocelyn@tamu.edu)[1], Alex Styer[2], Josephine Antwi[3], J. Scott Armstrong[4], Jason Wulff[1], Jennifer A. White[2], Samuel Nibouche[5], Laurent Costet[5], Gary Peterson[6], Neal McLaren[7] and Raul F. Medina[1], [1]Texas A&M Univ., College Station, TX, [2]Univ. of Kentucky, Lexington, KY, [3]Oregon State Univ., Hermiston, OR, [4]USDA - ARS, Stillwater, OK, [5]CIRAD, Saint-Pierre, France, [6]Texas A&M, Lubbock, TX, [7]Univ. of the Free State, Bloemfontein, South Africa

The sugarcane aphid (*Melanaphis sacchari* Zehntner) has been present in the United States (US) on sugarcane since 1977. It was not until 2013 however, that this insect became a pest in US sorghum. What could have caused this sudden pest outbreak in US sorghum after over 35 years of SCA being established in sugarcane? The microbiome of insects is known to play important roles in insect defense, heat tolerance, and in the production of essential amino acids. Populations of the same insect species are known to consume different host plants due to the presence or absence of a secondary bacterial endosymbiont. We examined the microbiome of sugarcane aphids on two agricultural plants (grain sorghum and sugarcane) and one weedy plant (i.e. Johnson grass) in agro ecosystems. This allowed us to determine whether the sudden outbreak on sorghum was due to a difference in microbiome among aphids on different host plants. Sugarcane aphid populations across the US had few bacteria. Using Illumina Miseq and PCR we did not detect bacterial endosymbionts commonly associated with other aphids (i.e., *Arsenophonus*, *Hamitonella*, *Regiella*, *Spiroplasma*, *Rickettsia*, or *Cardinium*). In addition, none of the SCA bacteria detected were found to be exlusively associated with any of the host plants we assessed. This study characterizes the SCA microbiome and provides evidence against the role of endosymbiotic bacteria in explaining the SCA outbreak on US sorghum.

3-8. Cross mating of two sympatric and morphologically similar ticks: *Amblyomma mixtum* and *A. tenellum* (Acari: Ixodidae).

Taylor Donaldson (taylorgdonaldson@email.tamu.edu), Pete Teel, Michael Longnecker and Otto Strey, Texas A&M Univ., College Station, TX

Two morphologically similar ticks *Amblyomma mixtum* and *A. tenellum* both occur in the same geographic areas and utilize the same species of hosts. These overlaps could allow for the possibility of hybridization to exist. It is the purpose of this study to investigate interbreeding between *A. mixtum* and *A. tenellum* and to compare laboratory development of individual crosses. The following four crosses were implemented on two calves: *A. mixtum* x *A. mixtum*, *A. tenellum* x *A. tenllum*, *A. mixtum* x A. *tenellum*, and *A. tenellum* x *A. mixtum*. For each of these crosses we compared drop-off duration, engorgement weight, egg production duration, egg mass weight, egg production efficiency, and larvae hatch percentage. Overall differences occurred among crosses for all comparisons with some similarities. We found that only one of the *A. mixtum* x *A. tenellum* cross females was able to produce larvae but in small numbers compared to the pure strains. Potential hybridization between these two tick species seems to be rare. Additionally, the role these hybrids have in the transmission of pathogens is not currently understood.

3-9. Detection of resistance in sorghum lines against sugarcane aphid, *Melanaphis sacchari* (Zehnter).

Sulochana Paudyal (sulochana.paudyal@okstate.edu)[1], J. Scott Armstrong[2], Kris Giles[1] and Ankur Limaje[1], [1]Oklahoma State Univ., Stillwater, OK, [2]USDA - ARS, Stillwater, OK

The sugarcane aphid *Melanaphis sacchari* (Zehnter) has emerged as the most significant threat to sorghum (*Sorghum bicolor* (L.) Moench) production in the United States. Since 2013, discovery of aphid resistant germplasm has been a priority all stakeholders involved. We screened twenty three different sorghum lines for resistance in a free choice assay by infesting entries with sugarcane aphids at the 3-4 leaf. Damage ratings were initiated when the susceptible control (Morhc 858) was estimated to be 85% dead. All plants were evaluated using a damage rating of 1–9 (little to high damage). Chlorophyll loss was also quantified in a no-choice test on infested and uninfested leaves of each of the lines using SPAD-502 chlorophyll meter. Based on plant height, number of leaves, and chlorophyll values from the free-choice study, sorghum lines 0L0030, 95207, G1213, GW1489, 97157, TX 2783, W 7431, W844-E, and DKS-37-07 were categorized as highly resistant with rating ≈3, indicating that good sources of sugarcane aphid resistance are available. In particular, Chlorophyll loss in the susceptible check (Morhc 858) was 80%, however, in the above resistant lines the loss figures were <20%. In the resistant lines, the mechanisms of resistance (antibiosis, antixenosis, and tolerance) have been determined, which will be helpful for future breeding programs.

3-10. Determining the minimum number of pollen grains needed for accurate honey bee (*Apis mellifera*) pollen pellet analysis.

Pierre Lau (plau0168@tamu.edu), Vaughn Bryant and Juliana Rangel, Texas A&M Univ., College Station, TX

Diverse floral diets have a positive impact on honey bee health and understanding the types of plants preferred by honey bee foragers provides valuable information to manage bee-friendly habitats. Recent studies have used palynology to better understand honey bee nectar foraging preferences and the International Honey Commission (IHC) has established standards for analyzing honey samples. However, standards for studying the plant taxonomic composition of honey bee pollen pellets have not been established. The goal of this project is to determine the minimum number of pollen grains that need to be counted to obtain an accurate floral representation present in a bee pollen pellet sample. To do this, pollen samples were collected from pollen traps and a subsample of pollen was acetolyzed and identified to the lowest taxonomic level possible. Cohorts of 100 pollen grains were counted successively five times for a total count of 500 pollen grains per colony. We found no statistically significant differences in the number of or percentages of floral taxa found between the 200 and 500 pollen grain counts in two out of the three colonies sampled. Shannon's diversity index suggested that the high taxa sample was attributed to a low presence of minor pollen types. Thus, a 200 pollen grain count seems sufficient to accurately assess the predominant, secondary, and important minor plant taxa present in a pollen sample, while a 500-grain count may be needed if the study aims to elucidate a more specific taxonomic assessment of floral types.

3-11. Evaluation of the *Aphidius colemani-Rhopalosiphum padi* banker plant system in Oklahoma greenhouse production.

Tracey Payton Miller (tracey.payton@okstate.edu)[1], Eric Rebek[1], Steven Frank[2], Kris Giles[1] and Mike Schnelle[1], [1]Oklahoma State Univ., Stillwater, OK, [2]North Carolina State Univ., Raleigh, NC

Banker plants (a.k.a, open rearing systems) consist of an arthropod natural enemy (i.e., predators or parasitoids), alternative prey or hosts for the natural enemy, and banker plants that support the alternative prey or hosts. In enclosed environments, banker plants provide long-term reproduction and dispersal of the natural enemy species aimed at control of a target pest. The *Aphidius colemani-Rhopalosiphum padi* banker plant system was compared with stand-alone augmentative releases of *A. colemani* to assess the advantages and disadvantages of each strategy against green peach aphid, *Myzus persicae*. Evaluations were made at three greenhouse cooperator sites in Oklahoma and each time replicate consisted of 3 treatments: banker plants, augmentative releases, and imidacloprid drenches. For each treatment, 24 ornamental pepper plants (*Capsicum annuum* 'Black Pearl') were infested with *M. persicae*. Banker plant treatments consisted of a wheat banker plant infested with parasitized *R. padi* aphids, replaced weekly. Augmentative releases consisted of *A. colemani* parasitoids only. Ornamental peppers were checked weekly for seven weeks and evaluated for aphid and mummy densities. Winter wheat banker plants were observed for overall health and presence of *A. colemani* mummies. Banker plant treatments resulted in a lower pest aphid density and higher parasitism rates than augmentative treatments. Also, banker plant treatments maintained pest populations at lower densities over time. Banker plants offer an environmentally friendly and innovative way to provide sustained management of common arthropod pests in the greenhouse.

3-12. Metabolic theory, nutritional ecology, and seasonal foraging in a prairie ant community.

Rebecca Prather (rebeccaprather@ou.edu) and Michael Kaspari, Univ. of Oklahoma, Norman, OK

All consumers must make choices among an array of essential nutrients that occur in a variety of packages. Two nutrients, sodium and sugar, are maintained near strict set points in animals, and vary in time and space in predictable ways. Moreover, consumer performance is often limited by shortfalls of sodium and sugar. Their cravings for both should increase with physiological demand and increased risk of environmental shortfall. We explored how temperature and trophic level co-determine cravings for Na and sugar in the ants of a temperate grassland. The metabolic hypothesis predicts that Na cravings should show an exponential increase with temperature. Since sugar can be stored, and Na catalyzes metabolism, sugar use should increase less steeply with temperature, and should account for less variation. From April-October, once a week we put out 300 Na and sugar baits three times a day. We found Na use increases faster and is better predicted by temperature than sugar use. Additionally, use of sugar baits increased throughout the day while Na use was more constant. In summary: demand for Na and sugar, two essential nutrients, vary predictably with environmental temperature.

3-13. Scalar habitat analysis of bee communities across agroecosystems on the Texas High Plains.

Samuel Discua (samuel.discua@ttu.edu), Scott Longing and Nancy McIntyre, Texas Tech Univ., Lubbock, TX

Agricultural intensification and the loss of natural habitats are factors that threaten pollinator populations across agroecosystems. On the Southern High Plains in western Texas, little is known about the influence of broad agricultural production and landscape mosaics on pollinator communities. This study was conducted to determine the relationships of local and scalar landscape structure on native bee abundance and richness across different agroecosystems across a six-county region in western Texas. In 2016, pollinator communities were sampled using pan traps and hand netting across 35 locations (i.e. homogenous habitat patches of various sizes). At each location, we quantified local habitat related to floral resources and the composition of vegetation along two 60m x 2m belt transects. At the landscape scale, land cover/land use was determined for 200, 500, 1000 and 4000 m buffers surrounding each location. We used mixed-effect models to assess the relationships of local habitat and scalar landscapes with wild bee abundances and species richness. Results from this study will improve our understanding of the influence of local and landscape level habitat on bee communities and therefore support strategies to enhance and restore pollinator habitat in this agriculturally dominant region.

3-14. The effects of soilborne pathogens on the colony structure of the eastern subterranean termite (*Reticulitermes flavipes*).

Carlos Aguero (cague001@tamu.edu)[1], Jason Martin[2], Mark S Bulmer[2] and Edward Vargo[1], [1]Texas A&M Univ., College Station, TX, [2]Towson Univ., Towson, MD

Termites are an important system for studying the evolution of social behavior in insects, but the cryptic nature of termite nests makes it difficult to observe the breeding structure of colonies in the field. Fortunately, we can learn much about the dynamics of a colony by using genetic tools. Molecular markers have revealed latitudinal variation in the amounts of inbreeding and the number of reproductives found in colonies of the eastern subterranean termite, *Reticulitermes flavipes*. Additionally, there is evidence that microbial pathogen pressure is a major selective force on termite colonies and this could potentially explain why we see differences in colony breeding structure. I plan to investigate the strength of the ecological interactions between termite colonies and the surrounding microbial community. First, field-collected termites from across their native range and from colonies of varying family types will be exposed to pathogens to determine how colony structure affects the survivability of termites. Next, a metagenomic analysis of the environment within and around termite colonies will be performed to not only quantify the pathogenic pressure that termites naturally encounter, but to observe the effectiveness of the various social and immunity-related colony defenses that termites have developed against pathogens. The results of this study will help us understand how disease has influenced the development of sociality in insects and highlight the factors important to termites for pathogen resistance.

3-15. The negative effects of in-hive pesticides on honey bee (*Apis mellifera*) drone spermatozoa viability.

Adrian Fisher II (solifuge9378@tamu.edu) and Juliana Rangel, Texas A&M Univ., College Station, TX

Honey bee (*Apis mellifera*) drones are produced seasonally for the sole purpose of mating with virgin queens from nearby colonies. Because drones do not contribute to other colony tasks such as food collection, brood rearing, or defense, they are often overlooked in honey bee research. However, a recent examination of drone spermatozoa viability (i.e., proportion of total spermatozoa in a drone's seminal vesicles that are viable and can fertilize an ovule) found significant variation in viability among drones from apiaries in different locations in Central Texas. This observed variation may be influenced by the contamination of the lipophilic beeswax with agrochemicals, as well as and beekeeper-applied miticides used in the treatment of the ectoparasitic mite *Varroa destructor*. Both pesticide groups have been found in high concentrations in wax samples across the United States and seem to be contributing to the decline of honey bee populations nationwide. To assess the potential effect of exposure to in-hive pesticides on drone spermatozoa viability, we compared the viability of spermatozoa collected from drones reared in pesticide-free wax to that of drones reared in wax contaminated with field-relevant doses of select pesticides. Using a standard sperm staining technique, live spermatozoa were stained with Sybr-14 while unviable spermatozoa were dyed with propidium iodide. The samples were then run through a cell counter (Cellometer Vision CBA, Nexelcom®), which identified viable and non-viable spermatozoa and provided relative cell counts in a sample. Our results suggest a significant negative effect of in-hive pesticide exposure during development on spermatozoa viability.

3-16. Utilizing stratified sampling data to develop a scouting plan for sugarcane aphid, *Melanaphis sacchari* Zehntner, in sorghum.

Jessica Lindenmayer (jessica.pavlu@okstate.edu)[1], Tom Royer[1], Kris Giles[1], Ali Zarrabi[1], Allen Knutson[2], Robert Bowling[3], Nicholas Seiter[4], Brian McCornack[5], Sebe Brown[6] and Norman Elliott[7], [1]Oklahoma State Univ., Stillwater, OK, [2]Texas A&M Univ., Dallas, TX, [3]Texas A&M AgriLife Extension Service, Corpus Christi, TX, [4]Univ. of Arkansas, Monticello, AR, [5]Plant Biosecurity Cooperative Research Centre, Bruce, Australia, [6]Louisiana State Univ. AgCenter, Winnsboro, LA, [7]USDA - ARS, Stillwater, OK

Grain sorghum (*Sorghum bicolor* (L.) Moench) also referred to as milo, is a warm season, drought tolerant crop that is grown across the Central and Southern US. The almost eight million acres of grain sorghum harvested in 2015 was valued at $1.67 billion, and is the highest production acreage since 2008. The sugarcane aphid (SCA) *Melanaphis sacchari* Zehntner (Hemiptera: Aphididae) has recently become the key pest on grain and forage sorghum. Initially causing significant yield loss in 2014, SCA subsequently expanded to 12 states in which 3.2 million acres reported crop damage. Management practices are currently limited to use of approved insecticides and some tolerant varieties, but there is no research-based economic injury level established. The overall objective of this research is to develop research-based efficient sampling protocols for SCA on sorghum that will be utilized by producers. In the summer of 2015, a stratified sampling protocol was used to sample 161 fields across six states in the southern region. Using nested ANOVA and Taylor's Power Law analyses, spatial distribution patterns for SCA count data within fields were described which allowed for determination of a 3-plant sample unit, and strong/significant relationships between means and variances allowed for preliminary calculations of sample sizes. Justifiable insecticide use needs to be based on accurate and precise scouting data. This and future data will be the foundation of customized, research based, sampling/scouting recommendations for farmers based on their growing region.

3-17. What is underreplication and how does this phenomenon contribute to the enigma of genome size evolution in *Drosophila*?

Carl Hjelmen (cehjelmen09@tamu.edu) and J. Spencer Johnston, Texas A&M Univ., College Station, TX

Underreplication, or the replication of only a portion of the DNA in each chromosome, has been documented throughout many tissues in *Drosophila*, such as polytene salivary glands, nurse cells, fat body cells, etc. Recently, a majority of cells in the thorax were also found to be underreplicated. Portions that are not replicated are known to be largely heterochromatic, filled with repeats and noncoding sequences. Since genome size has been shown to be linked to the amount of noncoding and repeats sequences, rather than coding sequences, we ask "Is the amount of replication that occurs in the thorax directly related to the genome size of a species and is this pattern consistent?" We also ask, "How might this largely heterochromatic portion of DNA be affecting genome size in a phylogenetic context?" To address these questions, we have estimated the genome size and percent replication of more than 70 species from the UCSD Species Stock Center. These data are then analyzed using traditional statistic methods as well as new comparative phylogenetic approaches. Data has shown that the level of replication is significantly correlated to genome size, with higher levels of variation in males, suggesting that the largely heterochromatic Y chromosome may have an effect on the percentage of replication. Preliminary phylogenetic analyses suggest that the amount of replication is constrained phylogenetically, with differences between males and females. These data support the conclusion that genome size change is largely, but not always, an increase or decrease in noncoding sequence.

3-18. Who, where, and when? A survey of Texas blow flies (Diptera: Calliphoridae).

Ashleigh Faris (ashmfaris@gmail.com), Maegan Fitzgerald and Aaron Tarone, Texas A&M Univ., College Station, TX

Calliphoridae are of medical, veterinary, and forensic importance. Although we know that blow fly species do not occur homogenously in space and time and that species have habitat and climatic preferences, there is no known blow fly survey for the state of Texas. Additionally, there is no documentation of how the distribution of calliphorid species might have changed across Texas over time. Over the past 50 years, Texas has inherited invasive *Chrysomya* spp and has also undergone the eradication of *Cochliomyia hominivorax* (Coquerel). In this study, 4,000+ blow flies housed in 5 state university museums from over 1,670 collecting events were identified. A digital database was created to inventory their identification, collection date, geo-referenced collection location, and collector. Maps were created in ArcMap 10.2 to depict species distributions, co-occurrence, and seasonality profiles for each species. Currently, 165 of 254 Texas counties are represented in this survey. Survey data supports the assertion that *Cochliomyia macellaria* (Fabricius), a native and forensically-important species, is widespread in Texas. The resulting distribution maps are useful for analyzing the impact of species invasion and eradication on competition for carrion and how this changes over time. Species distribution maps can also provide clues as to where populations may have appeared and established due to allopatric speciation. Additionally, these results address knowledge gaps that are useful in medical, veterinary, and forensic applications. These maps will help formulate hypotheses for future work concerned with the biology, behavior, and ecology of Calliphorids.

Student Competition: Master's Ten-Minute Papers

4-1. Population genetics and colony breeding structure of the tawny crazy ant (*Nylanderia fulva*).

Bryant McDowell (bryant868@tamu.edu), Robert Puckett and Edward Vargo, Texas A&M Univ., College Station, TX

Nylanderia fulva was first discovered in Texas and Florida in 2002. Since then, this invasive ant pest has spread to all southeastern Gulf States where it outcompetes native species, reduces arthropod species diversity, and infests urban, agricultural, and natural areas. Colonies of this ant are believed to be unicolonial in invasive populations, but to date this has not been explicitly investigated. It is important to understand the reproductive and social behaviors of this pest in order to develop effective strategies for managing their populations. In this study, we test the hypothesis that colonies in the invasive range of this ant are unicolonial using both behavioral assays and genetic characterization of colonies with microsatellite loci. We also report on the genetic structure of colonies across the southeastern U.S.

4-2. A phylogeny of Tristiridae (Orthoptera: Acridoidea) using molecular data.

Ryan Selking (Optimus1@tamu.edu)[1], Maria Marta Cigliano[2] and Hojun Song[1], [1]Texas A&M Univ., College Station, TX, [2]Univ. of Illinois at Urbana-Champaign, La Plata, Argentina

The grasshopper family Tristiridae (Orthoptera: Acridoidea) is one that occupies a peculiar place in the classification of Robert's Chasmosacci and Cryptosacci groups. This family could be the key to understanding the separation of the two groups. Additionally, the phylogeny of the family based on molecular data is absent and requires a study to further understand the relationships between the members of this family. It has been proposed previously that Tristiridae is closely related to Pyrgomorphidae (Orthoptera: Pyrgomorphoidea) and Lentulidae (Orthoptera: Acridoidea), so we have taken this on as our hypothesis. Using mitochondrial genome sequences from Next Generation Sequencing and three nuclear genes from previous data, we generated our own phylogeny and tested the previous hypothesis. We found that Tristiridae is most closely related to the grasshopper family Ommexechidae (Orthoptera: Acridoidea), and there was no representative of Pyrgomorphidae to compare to (however it is known that Pyrgomorphidae is in its own distinct superfamily). This study needs improvement with higher quality molecular data and a greater pool of tristirids however.

4-3. A darter's diet: Macroinvertebrate diet of the orangebelly darter (*Etheostoma radiosum).*

Melissa Reed (mleath@okstate.edu)[1], W. Wyatt Hoback[2], James Long[3] and Andrew Dzialowski[3], [1]Oklahoma State Univ., Skiatook, OK, [2]Oklahoma State Univ., Stillwater, OK, [3]Oklahoma State Univ., Stillwater,, OK

The orangebelly darter, *Etheostoma radiosum,* is a small native fish endemic to Oklahoma. Previous studies of this species collected in larger rivers showed selective feeding on aquatic insects, dominated by fly larvae. To test the hypothesis that darter diet would be similar in small streams, orangebelly darters were collected from five small tributaries of the Lower Mountain Fork River, using backpack electrofishing equipment. In February and April 2015, 141 darters were captured and dissected to examine stomach contents. Non-insect food items were grouped by order, while insect food items were identified to family. Prey composition was compared among tributaries. Orangebelly darters consumed a total of 11 food types, which were all aquatic organisms. Aquatic isopods were the most frequently consumed organism. Other common food items included aquatic insects in the families Heptageniidae, Chironomidae, Perlidae and Simuliidae (in order of abundance). Analyses of specific prey abundance and frequency of occurrence revealed that darters exhibited a generalist diet. A significant difference for consumed isopods was found among the tributaries. Darters in this study utilized different prey than previously reported. Additionally, for the first time, Acanthocephalan (spiny-head worm) parasites were found in the stomachs of 17 of the orangebelly darters from 3 tributaries. This study improves knowledge of freshwater biodiversity, ecology, and conservation and highlights differences in diet among populations of small fish inhabiting headwater tributaries and main channels in southeastern Oklahoma. It also highlights the importance of aquatic macroinvertebrates to an endemic freshwater fish species that is a specialized bottom feeder.

4-4. A laboratory rearing and bioassay chamber for thrips (Thysanoptera).

Alvaro Romero-Castillo (alv89@outlook.com)[1] and Sergio Sanchez-Peña[2], [1]Universidad Autonoma Agraria Antonio Narro, Saltillo, Mexico, [2]Universidad Autónoma Agraria Antonio Narro, Saltillo, Mexico

Thrips (Thysanoptera) include key plant pests worlwide. Their management is complicated by difficulties in their laboratory study. They are small, active insects that fly and run; they escape easily from containers, and are very susceptible to moisture extremes when confined. Thus, biological studies of thrips are difficult, complicating also evaluation of insecticides. We designed a simple, economical chamber that allows to maintain live thrips in excellent condition for up to eight days on bean (*Phaseolus vulgaris*) leaves. The chamber utilizes a 9-cm diameter plastic Petri dish. One 4.5 ml cryovial partially filled with moist cotton is inserted through fitted holes on the side of the dish; silicone is used to seal the vial-hole joints. Two small windows are made on lid and bottom of the dish and covered with glued 2 cm diameter filter paper circles for ventilation. One bean leaf (1-3 leaflets) is placed in the dish; the petiole is wrapped with the moist cotton in the vial. A hole made with a syringe needle on the side of the vial allows watering as needed. Selected thrips stages are placed in the dish bottom or leaf, the lid is placed and the chamber is finally sealed with Parafilm™ strips. This method allows to maintain adult flower thrips, *Frankliniella* sp. for 7 days with a mortality around 10%. We observed also oviposition on leaves, nymph eclosion and pupal development. Observations with onion thrips, *Thrips tabaci*, are similar. The chamber also allows good visual accesibility (direct and microscopic).

4-5. American burying beetle *(Nicrophorus americanus)* are most frequent in grassland habitats at Camp Gruber, OK.

Lexi Freeman (lexi.freeman@okstate.edu) and W. Wyatt Hoback, Oklahoma State Univ., Stillwater, OK

Within the past century, the American burying beetle, *Nicrophorus americanus*, (ABB) disappeared from roughly 90% of its historic range of 35 central and eastern U.S. states. Although there are many proposed causes for the decline in ABB populations, the most widely accepted is that the population declined as a result of carrion availability and alterations in habitat. At this time, ABB is hypothesized to be a habitat generalist. We conducted field surveys of ABB at Camp Gruber located in northeastern Oklahoma to determine if *N. americanus* utilize the same habitat throughout the season. We sampled three habitat types: savannah, grassland, and forested areas. To compare across seasons, ABB were sampled between August 26 and August 28 and between October 5 and 7. All 12 locations captured at least two ABB. Traps located in grasslands caught a higher number of ABB, (mean ± 1SE) 14.7 ± 2.13 compared to forests which caught 6.6 ± 2.13. Savannah habitats were intermediate, catching 9.5 ± 2.75 ABB. Sampling continued every other weekend until November and produced similar results. In October, traps located in grassland habitats had higher captures of ABB, 7.7 ± 3.07 when compared to forests which caught 2.8 ± 1.07 and savannah habitats at 3.5 ± 1.95 ABB. Across the season, ABB appear to favor grassland sites. By better understanding the seasonal activity and use of habitat by ABB we can aid in the conservation of this endangered species and assist in recovery plans.

4-6. Arbor day and the effect of hand-planted Nebraska forests on the American burying beetle.

Jacob Farriester (jacob.farriester@okstate.edu)[1], W. Wyatt Hoback[2] and Daniel G. Snethen[3], [1]Oklahoma State Univ. (Stillwater), Stillwater, OK, [2]Oklahoma State Univ., Stillwater, OK, [3]Little Wound High School, Kyle, SD

The endangered American Burying Beetle (ABB), *Nicrophorus americanus*, has populations in the Southern (Oklahoma and Arkansas) and North-central regions (Nebraska and South Dakota) of the United States. Some prior field studies have suggested *N. americanus* to favor mature forests while others have suggested it to prefer prairie habitats. Using carrion-baited pitfall traps, we captured and recorded *N. americanus* at two Nebraska forests that were hand planted in the 1940s in Cherry County, Nebraska. Sampling occurred in June and August of 2015 and 2016. Each trap was selected with different criteria by site, with transects arranged equally among three environments at Merritt Reservoir and in McKelvie National Forest. Based on the Nebraska habitat rating system, sampling at Merritt occurred in prime, good, and fair habitats while at McKelvie Forest transects were constructed from surrounding prairie into deep forest. Across traps that were rebaited and sampled for 5 nights each, 573 ABB were captured at Merritt and 20 associated with McKelvie Forest. While few ABB were found in pine forests, it was found most often along forest-edge and in prairies. Trap sites rated “Prime” caught the most ABB, and traps rated “fair” caught the second most, suggesting a need to update habitat rating scales in western Nebraska. These findings support a preference for less-forested environments in favor of open grassland. Southern populations may differ ecologically from northern populations and conservation should be focused by region.

4-7. Effect of temperature on development of sugarcane aphid, *Melanaphis sacchari*, on sorghum.

Philip Hinson (philison2@gmail.com) and Bonnie Pendleton, West Texas A&M Univ., Canyon, TX

The sugarcane aphid, *Melanaphis sacchari* (Zehntner), is a pest of sorghum, *Sorghum bicolor* (L.) Moench, and sugarcane, *Saccharum officinarum* L., in tropical and subtropical regions of the world. Sugarcane aphids have severely damaged sorghum in the US since 2013. Abiotic factors, especially temperature, affect development of insects including aphids. Understanding aphid developmental rates at different temperatures is important for evaluating and developing sorghums with durable resistance. Fecundity and longevity of sugarcane aphids were assessed on susceptible ‘Tx399 x RTx430’ sorghum at four cycling temperatures (11:24, 16:29, 21:34, and 26:39°C) and 65% relative humidity in an incubator. A photoperiod of 13:11 light:dark hours corresponded with daily warm and cool temperatures. In total, 48 aphids in clip cages were used at each temperature. The birth date of the first nymph produced in each cage was recorded. The nymph was retained and allowed to mature. Temperature significantly affected pre-reproductive, reproductive, and post-reproductive periods and longevity and fecundity of sugarcane aphids. The pre-reproductive period was 2.45, 1.29, and 0.97 days at 11:24, 16:29, and 21:34°C, respectively, more than twice as long at 11:24 as 21:34°C. Nymphs were produced for 19.9, 16.6, and 15.1 days at 11:24, 16:29, and 21:34°C, respectively. Post-reproductive period was 2.5 times longer at 11:24 than 21:34°C. Peak daily fecundity was 3 days earlier at 16:29 than 11:24°C. Total fecundity was greatest at 16:29, with fewest nymphs produced at 26:39°C. Longevity was 1.7 times longer at 11:24 than 21:34°C. Based on findings of this study, the ideal temperature for development of sugarcane aphids was 16:29°C.

4-8. Evaluating insecticide efficacy and residual activity for control of the sugarcane aphid *Melanaphis sacchari* (Zehntner).

John David Gonzales (johndavid.gonzales@ag.tamu.edu)[1], David Kerns[2] and Greg Wilson[3], [1]Texas A&M Agrilife Extension Service, Muleshoe, TX, [2]Texas AgriLife Extension Service, College Station, TX, [3]Texas A & M Univ., Bryan, TX

In recent years, the sugarcane aphid (SCA), *Melanaphis sacchari* (Zehntner) has become an important pest of sorghum in the U.S. To obtain more information about managing this pest with insecticides, research was conducted to evaluate efficacy and residual control of three insecticides, chlorpyrifos, sulfoxaflor and flupyradifurone. During 2015 and 2016, studies were conducted in Winnsboro, Louisiana. In an insecticide efficacy test conducted in 2015, plots treated with chlorpyrifos at 1 qt/ac, required re-treatment after 14 days based on a 50 SCA per leaf threshold. While sulfoxaflor at 1 oz/ac required re-treatment after 21 days and flupyradifurone at 4 fl-oz/ac did not require re-treatment. To better define residual activity, field-weathered bioassays were utilized during 2015 and 2016. Boot stage sorghum was treated with each insecticide, using the previously mentioned rates. At 0, 3, 7, 14 and 21 DAT, 8 leaves from the 9th node were removed and transported to the laboratory. Bioassays were conducted using methods adapted from the Insecticide Resistance Action Committee (IRAC, Method No. 019). Bioassay arenas consisted of individual 29-ml condiment cups, with a 2-ml layer of 1% agar solution. A 3-cm diameter hole was cut into each lid and sealed with single ply tissue paper to allow excess moisture to escape. Ten adult SCA were placed into each cup, bioassays were held in a growth chamber at 27 (± 1) degrees Celsius for 48h before assessing mortality. LD50’s for field-weathered chlorpyrifos and sulfoxaflor was approximately 6 days, while that for flupyradifurone was approximately 10 days.

4-9. Cattle fever tick, *Rhipicephalus (Boophilus) microplus* (Acari: Ixodidae) potential control on pastures by the application of urea fertilizer.

Brenda Leal (brenda.leal01@utrgv.edu)[1], Don Thomas[2] and Robert Dearth[1], [1]Univ. of Texas Rio Grande Valley, Edinburg, TX, [2]USDA - ARS, Edinburg, TX

Cattle fever tick, *Rhipicephalus (Boophilus) microplus*, spend 80-90% of their life cycle questing for a host. Standard treatment methods are limited to on-host applications, leaving the need for more alternative control methods directed to pasture infesting stages. Granular urea was tested in both standard pesticide efficacy methods in the laboratory and field trials to determine if there was a significant impact on adult reproduction and larvae survival. Under the conditions of this present study, there was no detectable effect on either female adults or larval stages.

Symposia

SYMPOSIUM: Urban Research and Outreach Programs in the Southwest

5-7. Pest exclusion using physical barriers: A sustainable future for new and existing structures.

Cassie Krejci (ckrejci@polyguard.com)[1], Roger Gold[2] and Chris Keefer[3], [1]Polyguard, Ennis, TX, [2]Texas A&M Univ., College Station, TX, [3]Syngenta, College Station, TX

Advances in the use of physical barriers to effectively exclude subterranean termites have made it possible to add new dimensions to integrated pest management strategies for both pre-construction and post-construction implementations. Particulate barrier systems have applications on the exterior of structures, and in and around interior plumbing penetrations. Sealants, membranes, and wire meshes can be used as effective barriers to invading insect populations at the soil, concrete slab, veneer interfaces, as well as soffit and roof areas. Advances in the development and installation of elastomeric membranes will provide opportunities for pest management professionals to effectively solve problems with cracked slabs, cold joints, and other construction abnormalities, which in the past have resulted in the incursion of pest populations.

Regular Ten-Minute Paper Oral

Regular Ten-Minute Oral

6-1. Impact of mycolactone produced by *Mycobacterium ulcerans* on life-history traits of *Aedes aegypti* (Diptera: Culicidae).

Abadi Mashlawi (amashlawi@tamu.edu)[1], Jordan Heather[2], Tawni Crippen[3] and Jeffery Tomberlin[1], [1]Texas A&M Univ., College Station, TX, [2]Jordan@biology.msstate.edu, Starkville, MS, [3]Agricultural Research Service, USDA, College Station, TX

Buruli ulcer (BU) is a globally recognized neglected tropical disease caused by *Mycobacterium ulcerans*. BU is the third most recurrent mycobacterial of humans globally after tuberculosis and leprosy. The disease results in dermal tissue necrosis exposing the tissues under the skin. Ulcers can reach 5 to 15 cm in diameter in some patients especially if they do not seek early treatment. Most cases involve individuals between the ages of 4 to 15 years. This disease was first noted in the late 1880's in Africa and has since been reported worldwide. The exact mode of transmission in BU is unclear; however, it is hypothesized contact with slow-moving rivers and associated biting aquatic insects, such as mosquitoes results in pathogen transmission. Recent research from our group demonstrated mycolactone as an attractant for adult mosquitoes seeking a blood-meal as well as oviposition sites. In this study, the impact of mycolactone (0.05 µg/mL), (0.5 µg/mL), (1.0 µg/mL) on immature life-history of *Aedes aegypti* (commonly occurs in same environment as *M. ulcerans*) was examined. We determined percent egg hatch was not significantly different across treatments. However, concentration did impact survivorship of larval mosquitoes to the adult stage. Future research will determine if development in the presence of mycolactone impacts decision-making by resulting mosquitoes seeking oviposition sites. If true, a synergistic effect with regards to the prevalence of BU and other *Ae. aegypti* associated diseases (e.g., yellow fever) may occur.

6-2. Bacterial volatiles mediate foraging behavior of the red imported fire ant.

Jennifer H. Sweeney (j_sweeney@tamu.edu)[1], Robert Puckett[1], Tawni L. Crippen[2] and Jeffery Tomberlin[1], [1]Texas A&M Univ., College Station, TX, [2]USDA - ARS, College Station, TX

Microbes associated with ephemeral resources (e.g., fruit, carrion) release volatile organic compounds (VOCs), which serve as public informational cues for insects foraging for such resources. Recent studies have shown that insect species commonly associated with the decomposition process of vertebrate carrion variably respond according to concentrations of certain VOCs produced by specific bacteria species, such as *Proteus mirabilis*. The red imported fire ant (*Solenopsis invicta* Buren) (Hymenoptera: Formicidae)

(RIFA) is both an urban pest and forensically relevant species. VOCs produced by bacteria could serve as important indicators of resource presence and quality. In this research, RIFA response to granular baits treated with varying concentrations of the VOCs indole, dimethyl disulfide, isobutylamine and phenylacetic acid (all known bacterial by-products), was determined. Understanding the behavioral mechanisms regulating RIFA foraging behavior could have implications not only for the broader field of ecology, but applications in pest control (e.g., developing more attractive baits or repellents) and the forensic sciences (e.g., understanding arthropod succession patterns).

6-3. Phosphine resistance in *Oryzaephilus surinamensis* (Coleoptera: Silvanidae) in the United States.

Zhaorigetu Hubhachen (jorigtoo.chen@okstate.edu)[1], Sandipa Gautam[2], Charles Konemann[1], George Opit[1] and Ed Hosoda[3], [1]Oklahoma State Univ., Stillwater, OK, [2]Univ. of California at Riverside, Parlier, CA, [3]President, Cardinal Chemical Company, Woodland, CA

Due to inefficient fumigation arising from leaky structures during phosphine (PH_3) fumigation, resistant populations have developed in several species of stored-product insects. Currently, there is lack of information on PH_3 resistance in the sawtoothed grain beetle, *Oryzaephilus surinamensis*. Additionally, there is no published PH_3 discriminating dose for eggs of *O. surinamensis*. Therefore, in the present study, we first estimated the discriminating dose for eggs of *O. surinamensis* using eggs of a susceptible laboratory strain and found it to be 28.4 ppm over a 3-d fumigation. Our data showed adults from 5 out of 14 populations to have detectable resistance, whereas eggs from all 11 populations had detectable resistance to PH_3. The resistance frequencies in both adults and eggs in "Box BF", "Box BR" and "OKWat" populations were > 90%. We estimated levels of resistance in these three populations by conducting dose-response tests and analyzing mortality data using probit analyses. LC_{99} values for adults of Box BF", "Box BR" and "OKWat" populations were 320.5, 290.7 and 263 ppm over 3 d fumigation, respectively. LC_{99}values for eggs from these populations were 1055.9, 1030.7 and 564.5 ppm over 3 d fumigation, respectively. The resistance levels of adults and eggs in the most resistant population, "Box BF" were 24.3- and 43.6-fold higher than those in the lab-susceptible strain, respectively. Resistance levels in eggs of the three populations were >3-fold higher than those in adults. Implications of these data are discussed.

6-4. Near infrared reflectance spectroscopy of bovine feces to detect the southern cattle tick, *Rhipicephalus (Boophilus) microplus.*

Brian Rich (briantaylorrich@gmail.com)[1], Don Thomas[2], Adalberto A. Pérez de León[3], Pete Teel[1], Robert John Miller[4] and Doug Tolleson[5], [1]Texas A&M Univ., College Station, TX, [2]USDA - ARS, Edinburg, TX, [3]Knipling-Bushland US Livestock Insect Research Laboratory, Kerrville, TX, [4]USDA-ARS, Edinburg, TX, [5]Texas A&M Univ., San Angelo, TX

The standard method of detecting cattle fever ticks (*Rhipicephalus (Boophilus) annulatus* and *R. (B.) microplus*) in the state-federal tick eradication program is physical examination of restrained cattle to find attached ticks. Ticks modulate host responses to blood feeding resulting in fecal chemistry changes through the immune, endocrine, digestive systems cascade. This presentation will discuss differences in near infrared spectra from manure of cattle infested with *R. (B.) microplus* to non-infested cattle as a basis for identifying tick infested cattle through non-invasive means.

6-5. Disrupting bacterial communication - a novel method for reducing mosquito attraction to a host.

Dongmin Kim (dongminkimkorea@gmail.com)[1], Tawni L. Crippen[2] and Jeffery Tomberlin[3], [1]Texas A&M, College Station, TX, [2]USDA - ARS, College Station, TX, [3]Texas A&M Univ., College Station, TX

Aedes aegypti, is a known vector of pathogens responsible for many infectious diseases, such as Zika, Dengue, and Yellow Fever. Several studies have looked at volatile organic compounds (VOCs), which are utilized by mosquitoes to find a host, as means to develop effective mosquito control. Skin-inhabiting bacteria, such as *Staphylococcus epidermidis*, produce specific VOCs, which play an important role attracting mosquitoes to human hosts. Still, little is known about the ecology of the bacteria and its role in mosquito behavior. Specifically, how bacteria communication (i.e., quorum sensing) regulates mosquito behavior. Therefore, this study examined the effect of disrupting *S. epidermidis* quorum sensing with synthetic furanones C-30, a quorum sensing inhibitor (QSI), on mosquito attraction. Triple-choice tests were conducted to elucidate the response of *Ae. aegypti* to a blood resource treated with bacteria, QSI + bacteria, and QSI respectively. Results demonstrate that *Ae. aegypti* were equally attracted to artificial blood-feeders treated with QSI and QSI + *S. epidermidis*. Interestingly, *Ae. aegypti* were less attracted (by 75.8%) to the blood-feeder treated with QSI + *S. epidermidis* compared to the *S. epidermidis* alone. This study is the first to demonstrate chemical disruption of bacterial quorum sensing with synthetic furanones C-30 suppresses mosquito attraction to hosts. This discovery may reveal the specific mechanistic relationship between bacteria associated with humans and the mosquito and could lead to the development of a novel strategy for preventing and managing mosquito vector-borne diseases.

6-6. Discovery of populations of the yellow fever mosquito *Aedes aegypti* in Oklahoma after 70 years of absence.

David Bradt (dave.bradt@okstate.edu)[1], Kristy Bradley[2], W. Wyatt Hoback[1] and Bruce Noden[1], [1]Oklahoma State Univ., Stillwater, OK, [2]Oklahoma Dept. of Health, Oklahoma City, OK

Aedes aegypti is an important subtropical vector species of many viruses including yellow fever, dengue, chikungunya, and Zika viruses. It is predicted to have a limited year-round presence in the southern United States. The species has not been scientifically documented to occur in Oklahoma since 1940. Surveys for adult mosquitoes were conducted at 42 sites across seven different cities in Oklahoma using three different mosquito traps between May and September 2016 to test the hypothesis that *A. aegypti* does not occur in Oklahoma. Unexpectedly, 88 adult *A. aegypti* were collected between July and September at 18 different sites in four different cities across southern Oklahoma. Centers for Disease Control (CDC) Mini Light Traps baited with CO_2 attracted the highest numbers of *A. aegypti* compared to Sentinel® traps baited with Biogents(BG)-lure and octenol and CDC Gravid Traps baited with Bermuda grass-infused water. The discovery of *A. aegypti* populations within urban/suburban areas in Oklahoma, far north of its anticipated range, is important from an ecological as well as a public health perspective.

6-7. Host immune response after repeated blood meal challenges by the relapsing fever tick, *Ornithodoros turicata*, Dugès (Ixodida: Argasidae).

Hee Kim (godzebu2002@yahoo.com)[1], Pete Teel[1], Job Lopez[2] and Adalberto A. Pérez de León[3], [1]Texas A&M Univ., College Station, TX, [2]Baylor College of Medicine, Houston, TX, [3]USDA - ARS, Kerrville, TX

The relapsing fever tick, *Ornithodoros turicata*, Dugès (Ixodida: Argasidae), is an obligatory ectoparasite and one of the predominant vectors of human tick-borne relapsing fever in North America, and putative vector of African swine fever virus. The biology, life cycle, preference for a nidicolous habitat and extreme longevity in the absence of a blood meal make exposure to *O. turicata* challenging to detect. In this study, we investigated the feasibility of using post *O. turicata* challenge host immune response as the basis of a new surveillance method for tick exposure to swine. Our results show significant increase in IgG production in a tick-challenged domestic swine model, which suggests the viability of host immune response-based survey for *O. turicata* exposure.

6-8. The horizontal transfer of *Salmonella* between the lesser mealworm (*Alphitobius diaperinus)* and their surrounding environment.

Tawni L. Crippen (tawni.crippen@ars.usda.gov), Cynthia L. Sheffield and Ross Beier, USDA - ARS, College Station, TX

The spatial and temporal dispersal of *Salmonella* between birds, litter and beetles has been established in previous studies. However the extent that various reservoirs act as critical components in the epidemiology of *Salmonella* infection during broiler grow-out and flock rotation has not been well delineated; in particular the interactions between insects and manure as agents of retention and dispersal of Salmonella. This study provides empirical data for this model in the form of bacterial loads that facilitate *Salmonella* transfer from residual insect reservoirs. Results showed differential *Salmonella* transfer dependent on initial inoculation concentration. When initially spiked with 10^3 cfu/ml; only a small, but not significant, amount of *Salmonella* was transferred through the manure and back to clean beetles. What was transferred appeared to distribute mainly to the external surfaces and was not acquired internally. However when initially spiked with 10^7 cfu/ml, a significant acquisition and transfer occurred both internally and externally to the beetle. The data obtained will be used in subsequent studies and correlated with facility management practices to develop intervention strategies to mitigate the establishment of and spreading from reservoir *Salmonella* populations contributing to the preharvest contamination of poultry flocks.

6-9. Management of the winter tick, *Dermacentor albipictus*, in Texas cow-calf production systems.

Samantha Hays (samanthahays_85@tamu.edu)[1], Pete Teel[1], Thomas Hairgrove[2], David Anderson[2], Sonja L. Swiger[3] and Jeffery Tomberlin[1], [1]Texas A&M Univ., College Station, TX, [2]Texas A&M AgriLife Research and Extension, College Station, TX, [3]Texas A&M Univ., Stephenville, TX

The winter tick, *Dermacentor albipictus*, is an annual parasite of cattle and other large ungulates in Texas from October to March when forage quality and quantity are low. Winter tick parasitism can result in body condition decline, poor reproductive performance, and transmission of *Anaplasma marginale*, causal agent of bovine anaplasmosis. This presentation will examine the temporal, spatial and host interactions impacting the scope of this problem for cattle producers. And, it will outline the scope of a study initiated on a Texas cow-calf production ranch to investigate the application of management tools to suppress the winter tick and its economic effects.

6-10. Bacteria harbored by adult stable flies (Diptera: Muscidae) on Texas dairies.

Pia Olafson (pia.olafson@ars.usda.gov)[1] and Sonja L. Swiger[2], [1]USDA - ARS, Kerrville, TX, [2]Texas A&M Univ., Stephenville, TX

Dairy operations in Texas confine cattle using either drylot or freestall housing, creating potential differences in the bacterial communities present in these environments. Fly species known to inhabit these confined operations include stable flies and house flies, both of which breed and develop in bacterial-rich substrates. Further, both fly species are known to mechanically disseminate bacteria, and a description of the communities harbored by flies at these settings is of interest. Stable flies were sampled in Texas from two freestall housing operations, one traditional dry lot dairy, and at one dairy on which half the operation is freestall and the other is drylot. A total of 160 flies (n=20 flies per dairy, 2 timepoints) were surface sterilized and individually macerated prior to culture on tryptic soy broth agar. Morphologically distinct colonies were selected and identified using 16S rRNA amplicon sequencing. The most abundant phyla represented were Proteobacteria (genera *Providencia*, *Pseudomonas*, *Serratia*, *Vibrio*) and Firmicutes (general *Bacillus*, *Staphylococcus*, *Enterococcus*), with isolates from Actinobacteria and Bacteroidetes also identified.

6-11. Phenome of acaricide resistance in the southern cattle fever tick (*Rhipicephalus microplus*): Molecular marker development.

Guilherme Klafke (gmklafke@gmail.com)[1], Jason Tidwell[2], Daniela Sanchez[3], Nicholas Jonsson[4], Robert John Miller[5] and Adalberto A. Pérez de León[6], [1]USDA-ARS Cattle Fever Tick Research Laboratory, Edinburg, TX, [2]USDA - ARS, Edinburg, TX, [3]Univ. of Texas Rio Grande Valley, Edinburg, TX, [4]Univ. of Glasgow, Glasgow, United Kingdom, [5]USDA-ARS, Edinburg, TX, [6]USDA - ARS, Kerrville, TX

The southern cattle fever tick (CFT), *Rhipicephalus microplus*, is regarded as the most economically important ectoparasite of livestock, principally cattle, worldwide. The U.S. officially declared the eradication of this invasive tick species in 1943. However, outbreaks still occur in the Permanent Quarantine Zone spanning a region in south Texas that borders northeast Mexico. A limitation for sustainable eradication in the U.S. is the emergence of acaricide resistance among CFT outbreak populations. Molecular diagnostic tools offer the opportunity to detect resistance rapidly, which can be complemented with confirmatory bioassay data that are more resource and time consuming to generate. Here, we report research on the innovation of molecular methods to detect mutations associated with CFT acaricide resistance. Genomic DNA fragments linked to acaricide target site genes (voltage-sensitive sodium channel for pyrethroids, gaba-gated chloride channel for fipronil, and octopamine receptors for amitraz) were amplified by PCR from resistant reference CFT from Brazil and Mexico. Sequencing analysis revealed multiple SNPs in the target site genes from geographically distinct lineages with different resistance phenotypes. This information will be used for high-resolution melting analysis of DNA fragments to develop a high-throughput method to genotype and detect allele-specific mutations in CFT outbreak populations to inform acaricide resistance management strategies in the U.S. This knowledge could also be adapted to integrated control programs in other parts of the world where CFT are endemic.

6-12. Behavioral responses and growth performance of horn fly (Diptera: Muscidae) infested cattle in New Mexico.

Brandon Smythe (bsmythe@nmsu.edu), New Mexico State Univ., Las Cruces, NM

Profitable animal performance of rangeland cattle is subject to a number of environmental interactions. Often, these interactions are presented to the animal through various sources of stress. Equally important to the presence these stressors, are the interpretations and subsequent responses to these exposures expressed by the animal. To date, evaluation of horn fly (*Haematobia irritans*) induced animal responses have been relatively limited to acute behavioral observations. Such responses are easily observable and quantifiable but fail to fully describe the complexity of this interaction and associated performance impacts. Furthering our understanding of how cattle respond to horn fly-induced stress throughout the duration of seasonal infestations may further define associated performance impacts. The objectives of this study were to evaluate the long-term behavioral responses and growth responses of cattle under the influence of horn fly-induced stress. The data used for evaluating cattle behavior were acquired from global positioning system (GPS) units fitted to the animal as a collar during a three year study conducted at the Corona Range and Livestock Research Center at Corona, New Mexico. The behaviors evaluated included, distance travelled, vertical and horizontal head movements, as well as visits to, time spent at, and maximum distance from water and woodland pasture features. In addition, cattle weight gain and calf weaning weights were evaluated. Data collected from this study as well as potential implications from these findings are to be discussed.

6-13. Integrated control of the southern cattle fever tick, *Rhipicephalus* (*Boophilus*) *microplus* in Puerto Rico.

Robert John Miller (robert.miller@ars.usda.gov)[1], Fred Soltero[2], Adalberto A. Pérez de León[3] and Charluz Arocho[4], [1]USDA-ARS, Edinburg, TX, [2]USDA - APHIS, Hato Rey, PR, [3]Knipling-Bushland US Livestock Insect Research Laboratory, Kerrville, TX, [4]USDA ARS Cattle Fever Tick Research Laboratory, Edinburg, TX

The southern cattle fever tick (SCFT), *Rhipicephalus* (*Boophilus*) *microplus*, is endemic in Puerto Rico (PR). A research partnership involving the livestock industry in PR, the PR Department of Agriculture (PR-DA), and the United States Department of Agriculture (USDA) was established to develop an integrated SCFT control program for the island. Several technologies were combined to mitigate the direct impact of SCFT, and its indirect effects as vector of bovine babesiosis and anaplasmosis. Novel anti-SCFT vaccine technologies researched by the USDA-Agricultural Research Service Knipling-Bushland U.S. Livestock Insects Research Laboratory (USDA-ARS-KBUSLIRL) in collaboration with animal health industry partners were pivotal to this project. The approach addressed food safety and environmental health concerns with the ecological impact, and potential residue levels of synthetic acaricides in cattle products like milk. The project included novel pesticide formulations containing natural products, which were labeled for use in, and around lactating cows. Through this project, dairy and beef cattle producers in PR now have access to an integrated tick control program allowing them to manage the health and economic impact of the SCFT on their operations.

Symposia

SYMPOSIUM: Insects in Food and Feed

7-2. Impact of larval competition on survivorship of the black soldier fly, *Hermetia illucens* (Diptera:Stratiomyidae).

Brittny Jones (moonbri_88@tamu.edu) and Jeffery Tomberlin, Texas A&M Univ., College Station, TX

The black soldier fly, *Hermetia illucens*, (L.) (Diptera: Stratiomyidae) is an insect rising in popularity due to interest in using it for reducing waste and producing protein for use as livestock, poultry, and aquaculture feed. However, there is a lack of data detailing the effects of larval density on resulting adult intraspecific competition for mates. This experiment examined the impact of larval population densities (500, 1000, 1500, 2000/ 54 g Gainesville Diet at 70% moisture) on survivorship, longevity, and size of black soldier fly larvae. Results indicate the lowest black soldier fly larval density (500) produced the heaviest adults. Larvae reared at this density also developed faster than those at the highest larval density (2000). These data could be used for optimizing larval density for mass production of black soldier flies in colony.

7-3. Rearing insects for innovative feed production: Development of the black soldier fly, *Hermetia illucens* (L.) (Diptera: Stratiomyidae) and house fly, *Musca domestica* (L.) (Diptera: Muscidae) on three manure types.

Chelsea Holcomb (chelseaholcomb@tamu.edu) and Jeffery Tomberlin, Texas A&M Univ., College Station, TX

The growing global population raises concern about future food security. Soymeal, fishmeal, and other sources of protein utilized in animal diets may become limited thus increasing the demand for alternative feed sources. Furthermore, an increase in the global population may lead to a rise in animal production, which raises concern about waste management. Rearing insects on animal manure could be an efficient solution to these problems, but a better understanding of bioconversion of different manure types by targeted insects is necessary in order to develop efficient systems for mass production. The black soldier fly, *Hermetia illucens* (L.), (Diptera: Stratiomyidae) and house fly, *Musca domestica* (L.), (Diptera: Muscidae) utilize manure for development. Larvae of both species fed manure produce prepupae (black soldier fly) and pupae (house fly) high in protein that are suitable ingredients in feedstuff for fish and livestock. However, house flies are considered pests because they transmit pathogens and spoil food. The purpose of this study was to evaluate the life history performance of each species fed three types of manure (poultry, swine, and bovine). Results may supplement existing data or give a new prospective on how these insects may be utilized for waste management or mass-produced as alternative feedstuffs.

7-6. Morphology of the male reproductive tract and sperm of the adult black soldier fly (Diptera: Stratiomyidae): Implication for adult colony maintenance.

Aline Spindola (aline.spin@tamu.edu), John D. Oswald and Jeffery Tomberlin, Texas A&M Univ., College Station, TX

Variations in the adult male reproductive system and sperm size of the black soldier fly could offer characteristics, which could aid future studies examining their effect on mating behavior and subsequent egg production. Comparative studies suggest sperm length and sexual organ morphology may increase in response to selection from sperm competition. However, the mechanisms driving this pattern remain unclear. The objective of this study was to describe the adult male reproductive system and sperm in three different categories. Males 2-4 days-old, 5-7 days-old and 8-10 days-old were dissected in a 0.65% physiological saline solution containing 0.1% of Giemsa stain. Body and wing size along with morphology of the reproductive organs were assessed with a dissecting microscope. Samples were photographed using a digital still camera (Olympus, Shinjuku, Japan). For sperm measurements, the testes were isolated and ruptured using fine needles to liberate the spermatozoa, which were collected and placed on slides. Slides were immediately examined using an ultra-high resolution field emission scanning electron microscope (FE-SEM). Sperm competition could favor the evolution of increased testes size and quality-sperm production.

7-13. Associated bacteria community in black soldier fly (Diptera: Stratiomyidae) larvae shift in response to host starvation.

Fengchun Yang (springyang@tamu.edu)[1], Heather Jordan[2] and Jeffery Tomberlin[1], [1]Texas A&M Univ., College Station, TX, [2]Mississippi State Univ., Mississippi State, MS

Black soldier fly larvae (BSFL) have been proposed as a potential agent for consuming and converting organic waste in vast quantity to valuable protein for use as animal feed. Previous studies demonstrated bacteria could improve larval nutrient uptake; therefore, understanding the role of associated bacteria on BSFL life-history (i.e., larval development) is important. In this study, we discovered a community shift due to larval host starvation, and we identified several key bacteria associated with BSFL starvation. We can potentially manipulate BSFL hunger to extend their feeding period by introducing the bacteria associated with host starvation. Therefore, we can improve the conversion efficiency and increase the protein production.

SYMPOSIUM: Advances in thrips management and the diseases they vector in the Southwestern US

8-1. Detection and response to emerging thrips-vectored diseases impacting Texas agriculture.

Steven Arthurs (sarthurs@tamu.edu)[1] and Kevin Heinz[2], [1]Texas A&M AgriLife, College Station, TX, [2]Texas A&M Univ., College Station, TX

Thrips vectored viruses are among the most serious of all plant pathogens, impacting ornamental, vegetable and other field crops. Since 2010, at least twenty different crops throughout the state were confirmed infected with tospoviruses, according to data from the Texas Plant Disease and Diagnostic Laboratory. In Texas, several new tospoviruses and at least one ilarvirus have recently been detected, and it is probable that additional ones will be imported through the plant trade. New vector-host relationships are also expanding the types of crops impacted, since there are also several new invasive thrips in the state. For example, the chilli thrips, *Scirtothrips dorsalis*, detected in Texas in 2005, is known to be competent for tospoviruses including the groundnut bud necrosis virus, peanut chlorotic fan-spot virus and peanut yellow spot virus. A survey would allow the threat of exotic thrips and vectored plant diseases to be better assessed. We are surveying tospoviruses and other thrips-vectored diseases that threaten Texas agriculture using seriological and molecular approaches, with initial efforts focused on ornamental plants.

8-3. An historical overview on thrips/tospovirus management programs in peanut.

Forrest Mitchell (f-mitchell@tamu.edu), Texas A&M Univ., Stephenville, TX

Thrips vectored tomato spotted wilt virus caused serious damage to the peanut crop in south Texas late in the last century. Production was centered in Frio and Atascosa counties with some large fields in Wilson and surrounding counties. In collaboration with extension specialists and the CEA-IPM program, mitigation efforts began in 1985-1986. These centered on pesticides at first and were effective against vectors, mainly the tobacco thrips. Expense and pest upset soon began to cause almost as many problems as were being solved. Fall armyworm, whitefly and spider mites were especially troublesome. Project scientists soon discovered that a window of optimal planting existed during which the risk of contracting TSWV was much less. Implementation of the window dramatically reduced losses and bought time for a tolerant peanut variety - TamRun 96 - to be developed and deployed. The combination of the two management tools restored profitability, reduced insectide use and arrested secondary pest damage.

8-5. Systems approach to the management of western flower thrips infesting ornamentals.

Kevin Heinz (kmheinz@tamu.edu)[1], Andrew Chow[2], Amanda Chau[3] and Peter Krauter[1], [1]Texas A&M Univ., College Station, TX, [2]Texas A&M Univ., Weslaco, TX, [3]Texas A&M Univ./Blinn College, Bryan, TX

Frankliniella occidentalis (Pergande), western flower thrips, is a severe and worldwide pest of greenhouse crops resulting from its ability to vector diseases and cause feeding damage. Because most greenhouse crops have relatively low thresholds to thrips damage, pest managers are often forced to aggressively implement control tactics for this pest. Rarely has one single approach provided reliable, economically feasible, and environmentally friendly thrips control. As a result, we propose the use of a systems approach as a foundational tool in building effective IPM programs. This approach included proper use of horticultural inputs, timely utilization of biological controls, and careful applications of insecticides. Results from studies focused on the development of each of these approaches and their contribution to a systems approach are presented to encourage thoughtful discussion, evolution, and implantation to novel systems

8-7. Genomic and biological characterization of tomato necrotic streak virus, a novel ilarvirus infecting tomato in Florida.

Ismael E. Badillo-Vargas (ismael.badillo@ag.tamu.edu)[1], Joseph E. Funderburk[2] and Scott Adkins[3], [1]Texas A&M AgriLife Research, Weslaco, TX, [2]Univ. of Florida NFREC, Quincy, FL, [3]USDA Agricultural Research Service, Fort Pierce, FL

A previously unknown plant virus was initially detected infecting tomatoes in Florida beginning in October 2013. Symptoms included virus-like necrosis of leaves, petioles and stems, and necrotic rings or spots on fruits similar to those caused by tospoviruses. However, a viral genome fragment was only amplified from total RNA by RT-PCR with ilarvirus primers. Sequence analysis indicated that the nucleotide and deduced amino acid sequences of this fragment were most similar to the RNA1 and replicase protein 1a, respectively, of subgroup 2 ilarviruses. Thus, a genomic and biological characterization was conducted for this new ilarvirus, for which the name Tomato necrotic streak virus (TomNSV) was proposed. The full genome sequence revealed that TomNSV is indeed a novel subgroup 2 ilarvirus most similar to Tulare apple mosaic virus. TomNSV has a narrow experimental host range restricted to four species in the Solanaceae and one species in the Chenopodiaceae plant families. All five susceptible plant species developed the characteristic symptom of necrotic streaks alongside veins from which the proposed virus name is derived. In tomato plants, the virus moved following the source-to-sink route, making fruits, flowers and young leaves ideal for sampling and detection of TomNSV. The seed transmission rate from fruits of infected tomato plants was determined to be 0.33%. Collectively, our results indicated that TomNSV is the causal agent of the necrotic streak disease of tomato observed in Florida since Fall of 2013. Potential TomNSV transmission by thrips similar to other ilarviruses is not currently known and requires additional research.

SYMPOSIUM: Public and veterinary health: What is a vector biologist's role

10-1. Citizen science advances Chagas disease research at the vector-human-animal interface.

Sarah Hamer (shamer@cvm.tamu.edu), Texas A&M Univ., College Station, TX

Members of the public and the veterinary community have been intertwined in the development of a Chagas disease epidemiology research program in Texas in 2012. Using a One Health approach, we have conducted a series of observational studies of *T. cruzi* in vectors, dogs, wildlife, and humans across Texas over the past four years in order to characterize transmission cycles, identify risk factors, and identify points for management interventions to reduce disease risk. Central to our approach has been the formal provision of outreach material to the public and the involvement of citizen scientists, predominantly for the submission of opportunistically-collected triatomine vectors and associated data to our program yielding an unprecedented sample set used to address research questions. Citizen-submitted vectors were associated with 60% infection by *Trypanosoma cruz*i, the etiologic agent of Chagas disease, comprised of two parasite discrete typing units (TcI and TcIV). Molecular bloodmeal analysis revealed different ratios of insect feeding on dogs, diverse wild and captive animals, or humans depending on the collection sites. We have identified multi-dog kennels as a potential risk factor, with over half (56%) of some working dog populations testing positive for exposure to the parasite with associated clinical disease including cardiomyopathy in some, but not all, infected dogs. Finally, we designed a Chagas disease outreach program in south Texas combined with a canine rabies vaccination campaign through which we can simultaneously sample the human and canine population for exposure to *T. cruzi*.

10-2. Stirring the sand in Namibia: A vector biologist's role in a developing country.

Bruce Noden (bruce.noden@okstate.edu), Oklahoma State Univ., Stillwater, OK

Vector-borne diseases occur throughout the world, but many impact populations in developing countries without being recognized. The role of a vector biologist in a country with developing public health and veterinary health systems can involve three main aspects: 1) developing vector-borne disease strategies based on identifying knowledge gaps built on global and historical perspectives; 2) providing assistance in the development of policies and guidelines in the implementation of nationally funded directives; and 3) encourage the development of country-based expertise in specific areas through research projects and higher level education. Between 2010-2013, I was privileged to work at the Namibia University of Science and Technology in Windhoek, Namibia. A country already engaged in eliminating malaria, I was part of strategy meetings in which policies and guidelines were established to achieve this national directive. It was also possible to use a variety of means to bring to light 13 other vector-borne diseases reported historically which were potentially and actually impacting public and veterinary health but were not thought to be important. By working inside a Namibian University, it was also possible to assist in the academic development of many Namibian faculty members, several of which have subsequently moved into Master's and PhD-level research projects. Altogether, a vector-biologist can have large role in assisting a developing country recognize the diseases which are present and assist in the developing local solutions and expertise to focus on the problem.

10-3. The role of academia when Zika hits the fan.

Gabriel Hamer (ghamer@tamu.edu), Texas A&M Univ., College Station, TX

The global emergence of Zika virus has presented unprecedented challenges for diverse agencies to collaborate and successfully manage. The stakeholders involved in the emergency management that took place concurrently in multiple states and regions includes federal, state, and local agencies working alongside representatives from professional societies, pest professionals, and academia. This presentation will outline the events that took place in Texas prior to and after local transmission of Zika virus. I will discuss multiple ways in which academia has played a role and continues to work alongside stakeholders to educate the public on Zika virus, conduct surveillance, and evaluate intervention campaigns. I will also highlight results of my lab's studies in South Texas addressing social-ecological factors of Zika virus emergence and intervention.

10-4. Exploring the ecology & behaviors of ixodid ticks in Oklahoma pastures.

Trisha Dubie (trishd@okstate.edu), Oklahoma State Univ., Stillwater, OK

Knowledge of the biology and ecology associated with arthropod vectors is essential to understanding regional epidemiology of vector borne disease. Many species have gaps in the research devoted to their interaction with local environments, and part of a vector biologist's role is identifying and addressing these deficiencies. Such gaps exist in the southern Great Plains where ticks can play an important role in vector borne diseases affecting livestock and humans. The blacklegged tick, *Ixodes scapularis* Say, the primary vector for *Borrelia burgdorferi*, the causative agent of Lyme disease, and the Gulf Coast tick, *Amblyomma maculatum* Koch, can both be difficult to recover off-host in Oklahoma. While Lyme disease is not considered endemic to Oklahoma, questions remain concerning the ecology of blacklegged ticks and the occurrence of *B. burgdorferi*. In order to help fill existing research gaps and improve collection methods, experiments were performed to examine the diel activity of both species. Field collections in diverse Oklahoma habitats were implemented in conjunction with caged bioassays to observe diurnal and nocturnal questing behavior. Blacklegged ticks were found to be more active during late afternoon and evening, and more ticks were recovered in pastures during the evening hours. Bioassays with Gulf Coast ticks showed no preference for specific times of day. These results suggest adjustments in collection times may be beneficial to *I. scapularis* research in the southern Great Plains. By observing species specific behaviors, vector biologists can refine and improve research assessing local arthropod vectors.

10-5. Ever changing challenges to prevent cattle fever tick infestations.

Pete Teel (pteel@tamu.edu), Texas A&M Univ., College Station, TX

The role of vector biologists in preventing the re-establishment of cattle fever ticks (*Rhipicephalus (Boophilus) annulatus* and *R. (B.) microplus*) in the United States will be discussed in the context of recent Texas outbreaks of tick infestations. Detection of these ticks on animals and properties result in quarantine, regulation of animal movement, and treatment requirements under state authority by agencies of the state-federal cattle fever tick eradication program. Implementation of regulatory operations creates concerns across a broad sector of interests at private, local, county, and industry-levels. Vector biologist's roles and responsibilities at the intersection of science, policy, regulation and the public will be examined.

10-6. A brief overview of the ear tick, *Otobius megnini.*

David H. Kattes (kattes@tarleton.edu), Tarleton State Univ., Stephenville, TX

Otobius megnini (Duges), often referred to as the spinose ear tick, is a one-host soft tick (Acari: Argasidae) native to southwestern United States and Mexico. It is currently found in many parts of the world spread probably via shipments of cattle and horses from Mexico. Larval and nymphal ticks are parasitic, feeding deep in the ear canal of numerous mammals, particularly large wandering ungulates. Final molt and reproduction occur off the host and the adults do not feed. Larvae can live up to three months without feeding whereas adults have been reported to live up to two years. Although implicated in the transmission of Q-fever, this tick has not been shown to transmit pathogens. In domestic animals morbidity is typically limited to irritation, secondary infections, and potential impacts on production. The ecology and biology of the ear tick is not well described and management is currently limited to topical treatment within the ear of host animal.

10-7. Vector abatement education and surveillance throughout the great state of Texas

Sonja L. Swiger (slswiger@ag.tamu.edu)[1], Molly Keck[2], Wizzie Brown[3], Michael Merchant[4], Bethany Bolling[5], Tom Sidwa[5] and Scott Weaver[6], [1]Texas A&M Univ., Stephenville, TX, [2]Texas AgriLife Extension Service, San Antonio, TX, [3]Texas A&M Univ., Austin, TX, [4]Texas A&M AgriLife Extension Service, Dallas, TX, [5]Dept. of State Health Services - Texas, Austin, TX, [6]Univ. of Texas Medical Branch, Galveston, TX

Texas is home to over 28 million people and most are susceptible to mosquito bites and arbovirus throughout the year. Educating Texans on the necessity to control for mosquitoes is extremely important and a large task for anyone. Texas A&M AgriLife Extension and the Texas Department of State Health Services have partnered for several years in these efforts. Since 2014, trainings around the state have educated 918 practitioners in 210 municipalities empowering city employees to protect Texans in their communities.

In this presentation, we describe the resources for public outreach available through the statewide network of Texas A&M AgriLife Extension Service entomologists and county extension agents. AgriLife Extension personnel provided 399 education sessions with 139,859 attendees and distributed 11,409 resources in 2016. Outreach through mass media, educated 2,211,649 individuals and over 76,400 newsletters were distributed. We discuss how this network was used in 2016 to enhance our statewide map of distribution of *Stegomyia* spp. Mosquitoes, and how county extension agents can be valuable partners in the fight against mosquito-borne disease.

In addition, we introduce the Western Gulf Center of Excellence for Vector-borne Diseases, one of 4 centers recently funded by the CDC for 5 years. The Center includes applied research projects, educational programs ranging from short courses designed for public health and vector control personnel to Ph.D. programs, and outreach activities for dissemination of information on the control of vector-borne diseases.

10-8. Communicating to cattle producers in Oklahoma: Speaking their language to stress the importance of external parasites

Justin Talley (justin.talley@okstate.edu), Oklahoma State Univ., Stillwater, OK

Extension entomology is a field that has seen drastic changes in the last decade especially with real time information at the tips of producer's fingers. In addition to providing easy to find information, cattle producers are a diverse group that have varying amounts of production knowledge. The concepts of insecticide resistance, economic thresholds and zoonotic pathogens are received with mixed understandings that lead to misconceptions among cattle producers. However, all cattle producers understand the concepts of weaning weights, pregnancy rates, average daily gains (ADG), body condition score and forage efficiency. To relate to these terms an entomologist trained in IPM can easily refer to economic thresholds but the challenge is how these terms are not always related to population levels but genetic background of the animal combined with management practices. Different scenarios will be presented on how to effectively communicate with modern cattle producers and identify key points regarding external parasites on beef animals.

Regular Ten-Minute Paper Oral

Regular Ten-Minute Orals

11-1. Effects of varying fire-return interval on terrestrial macro-arthropods in a mesquite-encroached shortgrass prairie: Abundance, diversity, and biomass.

Joy Newton (newtonj@unce.unr.edu)[1], Richard T. Kazmaier[2] and W. David Sissom[2], [1]Univ. of Nevada, Yerington, NV, [2]West Texas A&M Univ., Canyon, TX

Effects of frequency of prescribed burning on invertebrate abundance, diversity, and biomass were investigated in a shortgrass prairie encroached by mesquite, *Prosopis glandulosa* Torr., at Cross Bar Management Area in Potter County, TX. Invertebrates were collected from three burn treatments (frequencies of 2-3, 4-6, and 8-12 years) by using pitfall traps in 2007 and 2008. Analysis of variance was used to compare abundance, diversity, and biomass at the order and family levels using fire frequency, season, and year as main effects. In general, the season and year had more effect on abundance, diversity, and biomass than did burn frequency. These patterns are consistent with the idea that weather has more impact than fire on invertebrate biomass in shortgrass prairie. Longer-term monitoring of the effects of fire frequency is necessary to better elucidate long-term effects of burning on invertebrate communities in mesquite-encroached shortgrass prairie.

11-2. Consider the host plant! Crop variety influences populations of pests and natural enemies

Eric Rebek (eric.rebek@okstate.edu), Oklahoma State Univ., Stillwater, OK

Biological control programs are designed primarily with a focus on the target pest and its natural enemies. However, the crop itself is largely ignored with no consideration for crop factors that could influence the effectiveness of predators and parasitoids. Thus, reduced dimensionality of tri-trophic interactions among host plant-pest-natural enemy can negatively impact the successful implementation of biological control. Decreased success rates of alternative pest management tactics such as biological control means increased risk for growers, which disfavors adoption of IPM programs. Drawing from recent vineyard work in Oklahoma, this presentation will concentrate on bottom-up factors that can influence insect populations, both good and bad, discussed within the context of biological control.

11-3. Natural enemy interactions in winter wheat and canola systems

Casi N. Jessie, **Kris Giles** (kris.giles@okstate.edu) and William Jessie, Oklahoma State Univ., Stillwater, OK

In the Southern Plains, winter wheat and canola are increasingly being grown in rotation to reduce weed and pathogen pest pressure. Insect pests are crop specific in this rotation, but predators and parasitoids of aphid pests move between crops and their interactions may enhance or reduce biological control services. We discuss local movement and interactions of common natural enemies and the implications for pest management in this rotational agricultural system.

11-4. IPM of the cotton fleahopper in 2017.

Stephen Biles (biles-sp@tamu.edu)[1], Michael Brewer[2] and Robert Bowling[3], [1]Texas A&M Univ., Port Lavaca, TX, [2]Texas A&M AgriLife Research, Corpus Christi, TX, [3]Texas A&M AgriLife Extension Service, Corpus Christi, TX

Research was conducted to evaluate the behavior and economic thresholds of the cotton fleahopper in recent years. These trials evaluated pest survival to insecticides, fruit losses associated with insect survival and action thresholds to initiate control measures. Results from these trials will be discussed.

11-5. Insect pest management in speciality crops using *Beauveria bassiana* and azadirachtin based commercial formulations.

Manuel Campos (mcampos@biosafesystems.com), BioSafe Systems, East Hartford, CT

Biological and Botanical (B/B) based insect pest control products have increasing acceptance in specialty crop protection due to their unique modes of action combined with non-toxic and low/non-residual nature. Success from use of these products depend primarily on understanding their specific modes of action, application program, inherent advantages and limitations and integration with the existing pest management programs. The objective of this presentation is to discuss technical details of commercial B/B formulations from BioSafe Systems based on Entamopathogenic fungus *Beauveria bassiana* and Azadirachtin, labeled for use in Insect pest management.

11-6. The feeding and reproductive behavior of global haplotypes of *Melanaphis sacchari* (Hemiptera: Aphididae).

Greg Wilson (gregwils@tamu.edu)[1] and David Kerns[2], [1]Texas A & M Univ., Bryan, TX, [2]Texas AgriLife Extension Service, College Station, TX

During the past four years, sugarcane aphid [*Melanaphis sacchari* (Zehntner)] has significantly impacted grain sorghum (*Sorghum* *bicolor* L.) production in the United States and Mexico. Currently, the origin and biology of *M. sacchari* (infesting sorghum) is not clearly understood but it is theorized that the host range expansion occurring in 2013 was caused by either A) emergence of a new *M. sacchari* biological type through mutation or recombination, B) U.S. introduction of an already previously evolved type, or C) possibly a change in aphid gut symbionts, virus, or other microorganism due to introduction to new habitats. A series of 3 experiments were initiated in 2016 investigating feeding and reproductive behaviors of this economically important pest, since there is a clear need to assess the role of antixenosis and colonization in genotypic reaction against *M. sacchari* to identify lines with different mechanisms of resistance to this pest First: Potential host range was examined through 21 day no-choice studies of 54 graminous species. Second: Antixenosis to selected grasses was tested through a closed system multi-choice test of 16 selected grasses. Third: Aphid reproduction was compared by bioassay of 5 grass spp. Results from no-choice test identified grasses which supported temporary or long-term parthenogenic reproduction and of these 15 spp., 6 spp. in the genus *Miscanthus*, *Pennisetum, and Sorghum* were preferred by population ${}_{SI.WINN}M.sach_{04.2016}$ as hosts during the antixenosis test. Finally, results of reproductive test show that our isolated population has significantly greater reproductive potentials on sorghum versus the other grass treatments.

11-8. Modeling effects of landscape context on parasitism of cereal aphids in wheat by *Lysephlebus testaceipes.*

Norman Elliott (norman.elliott@ars.usda.gov)[1], Michael Brewer[2], Kris Giles[3] and Mpho Phoofolo[3], [1]USDA - ARS, Stillwater, OK, [2]Texas A&M AgriLife Research, Corpus Christi, TX, [3]Oklahoma State Univ., Stillwater, OK

We included seven factors as predictors of parasitism in stepwise regressions for autumn. The best fitting first-order regression model for the number of *L. testaceipes* in autumn (F = 6.72; df = 4, 65; P = 0.0001) was, *L. testaceipes* = $11.56 + 4.90 \cdot F1 - 7.76 \cdot F3 + 4.93 \cdot F4 + 5.66 \cdot F5$ (R^2 = 0.30). No other predictors were significant at the α = 0.15 level. Regression models for *L. testaceipes* parasitism in wheat fields in autumn were interpreted based on standardized factor loadings on the original landscape variables. For the regression model four factors, *F1, F3, F4,* and *F5* entered significantly. The regression coefficient for *F1* was positive, and the largest loadings on *F1* were for % summer crops (0.75) and % grassland (-0.71), indicating that the presence of high acreage of summer crops increased parasitism in wheat in autumn, whereas the presence of large amounts of grassland was detrimental to parasitism. Factor *F3* had a negative regression coefficient and was dominated by a large loading on % wheat (1.23), indicating a negative effect of wheat mono-cropping on parasitism rates in autumn. The positive regression coefficient for *F4* combined with the large factor loading on patch density (1.18) indicates a positive influence of small patch (field) size in the landscape on parasitism rates. Finally, the positive regression coefficient for *F5* combined with the dominant positive loading on fractal dimension (1.19) indicates a positive effect of curvilinear patch boundaries, characteristic of semi-natural and natural lands, on parasitism rate.

11-9. Grain protectants available for stored grains.

Edmond L. Bonjour (edmond.bonjour@okstate.edu), Oklahoma State Univ., Stillwater, OK

Treating grain as it is loaded into a storage facility is one component of a good IPM system to help protect the grain from insect damage. Insecticides available for use on stored grains will be discussed as to their advantages and disadvantages on specific commodities and what insects they are most effective against. Combining grain protectants within an overall management strategy is key to maintaining grain at a high quality.

Poster Abstracts

Student Poster Competition

Student Competition - Ph.D. Posters

P1-1. Efficacy of botanicals to control maize weevils (Coleoptera: Curculionidae) in stored sorghum grain.

Hame Abdou Kadi Kadi (hkadikadi@yahoo.com) and Bonnie Pendleton, West Texas A&M Univ., Canyon, TX

Insects damage 5-35% of stored grain worldwide; damage is ≥40% in most developing countries such as Niger (West Africa) in the tropics. Weevils are primary pests of stored sorghum, *Sorghum bicolor* (L.) Moench, and other grains. Worldwide, maize weevil, *Sitophilus zeamais* Motschulsky, causes most damage to stored grain. Farmers use pesticides to control storage pests. Alternatives are needed to reduce pesticide residue in cereal grains. A survey indicated that farmers in Niger used eight plants to control storage pests. Botanicals are inexpensive and environmentally friendly compared to synthetic pesticides. Efficacy of plant species to control maize weevils in stored sorghum was assessed. Treatments were powders of four botanicals (leaves and bark neem, *Azadirachta indica*; mesquite, *Prosopis glandulos*a var. *glandulosa*; and milkweed, *Asclepias speciosa*) and a check (no plant material). Weevils were exposed at 7-day increments to five quantities of each plant powder separately to assess the number killed. Powder of each plant was provided separately to weevils to determine oviposition deterrence. Numbers of adults produced were recorded. Results showed that the plants tested have potential to kill maize weevils. Thus, the active ingredients could be isolated to develop botanical products to control storage insects of sorghum and other grains.

P1-2. Corn hybrid and *Bt* transgene performance in yield and protection from pre-harvest losses caused by lepidopteran feeding.

Luke Pruter (lpruter@tamu.edu)[1], Michael Brewer[2], Mac Young[3] and Julio S. Bernal[4], [1]Texas A&M, Bryan, TX, [2]Texas A&M AgriLife Research, Corpus Christi, TX, [3]Agricultural Economics, Corpus Christi, TX, [4]Texas A&M Univ., College Station, TX

Lepidopteran species such as the fall armyworm and corn earworm are continuous residents of south Texas and are known to reduce health and value of corn. This year 79% of the commercial corn grown in Texas had at least one *Bt* trait incorporated into the hybrid to help control these species. *Bt* traits are used to prevent pre-harvest losses caused by lepidopteran feeding, but it has been difficult to separate value of the *Bt* trait in protecting yield from differences in yield due to hybrid background. Using near isogenic families of hybrids grown in Texas, we compared yield and ability to reduce lepidopteran feeding in three hybrid groups that only differed in *Bt* traits. Our field trials demonstrated the effectiveness of hybrids containing the Agrisure™ Viptera® trait to reduce insect injury significantly more than hybrids containing other *Bt* traits. However, hybrid background had a substantial effect on yield and could mask the yield benefits of the *Bt* trait in reducing insect injury to the ear. Financial indicators were used to project hybrid economic performance in profit/acre in these hybrids using current seed and other costs and market corn value.

P1-3. Mosquito larvicidal activity of new entomopathogenic nematodes from Northeastern Mexico.

Diego Treviño-Cueto (diego.-tc@hotmail.com)[1] and Sergio Sanchez-Peña[2], [1]Universidad Autonoma Agraria Antonio Narro, Saltillo, Mexico, [2]Universidad Autónoma Agraria Antonio Narro, Saltillo, Mexico

Mosquitoes (Culicidae) are the most significant vectors of human diseases. Entomopathogenic nematodes (EPN) are widely used agents of biological control of soil insect pests. Reports indicate that these terrestrial EPN are able to infect the aquatic larvae of mosquitoes. We isolated EPN strains (*Heterorhabditis* and *Steinernema,* including one undescribed new species of *Heterorhabditis*) from soil at the Mexican states of Coahuila and Tamaulipas. Strains were reared in the laboratory in mealworm (*Tenebrio molitor*) larvae, and their pathogenicity was tested against larvae of the common house mosquito, *Culex quinquefasciatus*. 3rd- and 4th-instar larvae were exposed to infective juveniles of five strains of EPN in trays. Only the undescribed species of *Heterorhabditis* from Coahuila was capable of killing mosquito larvae, as follows: at dosages of 1, 5, 15, 100, 500,750 juveniles/ larvae, mortality levels were 0, 0, 0, 33.3, 80 and 90% after 72 hours. Nematodes were able enter the hemocoel, presumably after being ingested. Unlike some previous reports, this *Heterorhabditis* reached the adult stage (usually only one adult nematode/larvae) and reproduced in this host; up to 90 % of adult nematodes in larvae produced 100-200 juveniles/nematode. The bacterial symbiont (*Xenorhabdus*) of the nematode proliferated and turned larvae reddish-pink. Active juveniles escaped from some killed larvae; thus horizontal transmission might be possible in this host. *Heterorhabditis* might act as biological control agents of mosquitoes in some scenarios.

Student Competition - Undergraduate Posters

P2-1. Effect of minerals on the distribustion of ear ticks (*Otobius megnini*) within animal shelters at the Fossil Rim Wildlife Center.

Hannah Walker (hannahag16@gmail.com) and David H. Kattes, Tarleton State Univ., Stephenville, TX

In 1949, H. E. Parish noted the presence of spinose ear ticks, *Otobius megnini*, under all 37 salt troughs located on two ranches in Kimble Co., TX. He further reported finding 9180 ticks under 11 troughs located on a ranch that maintained 5000 head of cattle. The study described here was designed to determine the effect of the presence of salt and/or mineral sources on the distribution of these ticks within animal shelters at the Fossil Rim Wildlife Center located at Glenrose, TX. Treatments were commercially prepared animal mineral sources in the solid block form. These treatments included: 99.9% NaCl block, mineral block with various minerals and vitamins, non-soluble concrete cinder block and a control. Each treatment was replicated inside three shelters and again outside the shelters. This research was conducted in the spring of 2013 and again in the fall of 2016. There were significantly greater number of larva ear ticks under the sodium chloride blocks than the other treatments.

P2-3. Questing behavior and presence of tick-borne pathogens in *Ixodes scapularis* in Oklahoma.

Justin Turner (justin.turner11@okstate.edu)[1], Trisha Dubie[2] and Bruce Noden[2], [1]Oklahoma State Unversity, Stillwater, OK, [2]Oklahoma State Univ., Stillwater, OK

Lyme disease and human granulocytic anaplasmosis are diseases transmitted by *Ixodes scapularis*. In Oklahoma, minimal research has been performed on whether *I. scapularis* are infected with *Borrelia burgdorferi* or *Anaplasma phagocytophilum*. The aim of this study was to learn more about the questing behavior of these ticks in Oklahoma and test field-collected *I. scapularis* for *B. burgdorferi* and *A. phagocytophilum*. Our hypotheses were two-fold: 1) adult *I. scapularis* in field sites are more active after 6 PM and 2) there is no evidence of *B. burgdorferi* and *A. phagocytophilum* in field-collected *I. scapularis*. In total, 131 ticks were collected from pastures and parks in Central and Northeast Oklahoma using a flagging technique. Collections were repeated every two hours for 45 minutes beginning at 12 PM until 8 PM. Repeated collections demonstrated an increase in tick activity after 6 PM and a preference was observed at the interface of the fields and woods compared to heavily wooded area. Polymerase chain reaction (PCR) is currently being used to test 47 pools of adult field-collected *I. scapularis* for the presence of *B. burgdorferi* and *A. phagocytophilum* DNA. The increased knowledge of *I. scapularis* questing behavior in Oklahoma will aid in future collections. Results from the testing will also provide information as to whether *B. burgdorferi* and *A. phagocytophilum* are present in adult field-collected *I. scapularis* in Oklahoma.

P2-4. Neonicotinoid insecticide resistance in populations of the potato psyllid (*Bactericera cockerelli)* across Texas.

Kristyne Varela (kristyne.varela@ag.tamu.edu)[1] and Ada Szczepaniec[2], [1]West Texas A&M Univ., Canyon, TX, [2]Texas A&M AgriLife Research, Amarillo, TX

The potato psyllid (TPP), *Bactericerca cockerelli,* a vector of a pathogen causing the “zebra chip” (ZC) disease in potatoes, is by far the greatest threat to profitability of potato production in Texas. TPP has many generations each year and easily migrates over large distances. It has been managed primarily by use of insecticides at planting and later throughout the potato-growing season, with as many as 10-12 insecticide applications during the season to suppress TPP. Another important factor contributing to the high likelihood of resistance development is lack of any regulation of insecticide use in Mexico, just south of the largest potato-growing region in Texas. TPP are highly mobile and influx of resistant psyllids from Mexico to Texas is likely. Thus, TPPs from all of the major potato-growing regions of Texas were tested for resistance to neonicotinoid insecticides, the main class of pesticides used to suppress TPP at planting. We found evidence of resistance to the neonicotinoid insecticides in all of the TPP populations, although the level of resistance differed among regions.

P2-5. Field evaluation of standard pressurized spray application to application with a mist blower applicator of four acaricides for the control of lone star ticks (*Amblyomma americanum*) in turf.

Rylee Wilson (rylee.wilson@okstate.edu)[1], Kylie Sherrill[2], Kelli Black[1], Nathan R. Walker[2] and Justin Talley[2], [1]Oklahoma State Unviversity, Stillwater, OK, [2]Oklahoma State Univ., Stillwater, OK

The objective of this study was to evaluate efficacy of Demand CS®, Demand CS® plus Archer® insect growth regulator, and Archer when applied as a pressurized spray compared to application with a mist blower applicator to turf infested with Lone Star Ticks (*Amblyomma americanum*). Demand CS® insecticide and Archer® insect growth regulator are used to create barrier treatments for mosquitos in residential and commercial areas. Treatments are typically applied to landscape vegetation and other suitable mosquito landing areas such as under decks, porches, etc. We wanted to test this same type of application to determine if it could be utilized to control ticks around human dwellings, especially turf settings. Lone Star ticks were coated with ECO11 Day-Glo™ powder one day prior to treatment. Plastic pots were filled with sand with a turf plug in the middle. Each container was marked with treatment number and a three-digit identification number. The marked ticks were placed onto the turf plug in the container and sprayed or misted with the designated treatment. The pots were set in the green house for 48 hours and then mortality counts were taken by destructive sampling. All mortality means were compared with ANOVA. The combination product of Demand CS® + Archer® demonstrated 100% mortality when applied as a pressurized spray. These results demonstrate that Demand CS applied with Archer had a higher efficacy against Lone Star Ticks than Archer applied by itself, Also, these results show a spray application method performed slightly better than a mist application.

P2-6. Identifying co-circulating hemoparasites in the WNV transmission cycle in East Texas.

Dayvion Adams (ajadams968@tamu.edu), Gabriel Hamer, Matthew Medeiros and Andrew Golnar, Texas A&M Univ., College Station, TX

This importance of this research is to identify the relationship of infection patterns of West Nile Virus among mosquito hosts around Texas as well as the cocirculation of Haemosporida between the two. It will also be determined if *Plasmodium* affects the transmission and infection rate of Avian Malaria. The majority of this research will be comprised of screening Culex quinquefasciatus banks to determine the presence of Haemosporida. These samples were collected from throughout East Texas and were labeled accordingly. Upon completion, we will better understand the impact that Plasmodium has on WNV transmission and infection in Texas, and will have a disease model to estimate the impact of Plasmodium in the understudied regions of East Texas. We will also have a better understanding of the *Plasmodium*-bird and *Plasmodium*-mosquito interactions.

P2-7. Is body size of metallic green sweat bees *Agapostemon* spp. (Hymenoptera: Halictidae) related to floral resource abundance?

Bryan Guevara (bryan.larrea@ttu.edu), Samuel Discua and Scott Longing, Texas Tech Univ., Lubbock, TX

The metallic green sweat bees *Agapostemon* spp. (Hymenoptera: Halictidae) are among the most common native bees in North America, with four species occurring in the Texas High Plains. Seasonal floral abundance on the Texas High Plains can vary widely depending on land use; therefore, *Agapostemon* spp. bee size and health may be affected by the amount and diversity of floral resources available in local habitats. The objective of this study was to determine the relation between bee size and floral resource abundance and diversity across different agroecosystems. We hypothesized a tradeoff between bee body size and floral resource abundance; this relationship was investigated both spatially across different farms and temporally across three sampling periods. We used morphometric analyses of bee wing venation and measurements of body size to discriminate bee species. Results from this study will help to determine the relationships of floral abundance on bee body size and provide supporting information to improve pollinator habitat on the Texas High Plains.

P2-8. Habitat associations of darkling beetles (Coleoptera: Tenebrionidae) at the Monahans Dune System of Western Texas.

Torie Whisenant (torie.whisenant@ttu.edu), John Bennett, Samuel Discua and Scott Longing, Texas Tech Univ., Lubbock, TX

The Monahans Sune System is home to a variety of endemic psammophilic animals and plants. Ten species of darkling beetles have been documented to occur in this dune system, with Epitragosoma arenaria restricted to the sandhills in the region and listed as a state species of concern in Texas. We sampled insect communities from June to August 2014 across six different habitat types using pitfall traps and standard transects. Species abundances were compared across the six different vegetation types using repeated measures analysis. Results from this study will help to determine habitat associations of these darkling beetles while providing further information to assess threat to the insect communities of this unique ecosystem.

P2-9. Beneficial insects of mass-flowering wildflowers across agricultural landscapes on the Texas High Plains.

Robert Wright (robert.l.wright@ttu.edu), Bryan Guevara, Samuel Discua and Scott Longing, Texas Tech Univ., Lubbock, TX

The conversion of natural and semi-natural habitats to large-scale agriculture threatens the biodiversity of farmland. Impacts to biodiversity in these settings could affect pest control and pollination services provided by insect communities. In the agriculturally intensive region of the Texas High Plains, information is lacking regarding the contributions of non-crop flowering habitats and their biota to ecosystem services related to crop production. The objective of this study was to survey mass-flowering wildflower patches among agricultural landscapes and to document the occurrences and abundances of beneficial insects including pollinators and natural enemies of crop pests. In 2016, we collected insects from thirteen naturally-occurring wildflower patches and determined the alpha and beta diversity of beneficial insects within and among patches. Field studies in 2017 will involve resampling these habitats to assess within-site annual variation and determining landscape-scale factors influencing local insect communities. This study will provide information to assist producers in managing farmland habitats to benefit crop production and biodiversity conservation in the region.

P2-10. Developing a novel assay to identify permethrin resistant horn fly (Diptera: Muscidae) populations.

Derek Cosper (dcosper@nmsu.edu) and Brandon Smythe, New Mexico State Univ., Las Cruces, NM

The horn fly (*Haematobia irritans*) is an obligate ectoparasite of rangeland cattle known to affect animal performance leading to economic burdens for producers. Often, producers use various insecticidal products aimed at alleviating losses associated with naturally-occurring horn fly populations. Many of these products are readily available and formulated for lasting control. Unfortunately, extended exposures occur often resulting in increased expressions of resistance in field populations. Methods to detect insecticide resistant horn fly populations are limited and therefore, are often preceded by product failure and producer concerns. Early identification of insecticide resistant horn fly populations is key to maximizing animal performance and producer return. Therefore, the objective of this study was to develop a novel resistance detection assay to rapidly identify permethrin resistant horn flies. A susceptible (SS) and permethrin resistant (PR) horn fly strain were used to standardize the assay. Horn flies were exposed to filter papers impregnated with 314.02 µg / cm^2 permethrin and assessed for mortality to develop lethal time (LT_{50}) estimates for both populations. Mean LT_{50} was 179.94 and 9.15 min for PR and SS, respectively. The results of this study will be used to further standardize the assay prior to field deployment. The implications of these findings being applied in a field scenario will be discussed.

P2-11. Masked killers: A laboratory exercise on dragonfly predation of mosquito larvae.

Thomas Hess (tmhess@okstate.edu), W. Wyatt Hoback and Bruce Noden, Oklahoma State Univ., Stillwater, OK

Mosquitoes are the most dangerous animals in the world killing up to a million humans per year. Mosquito larvae are aquatic filter feeders that are most often managed with chemicals; however many organisms provide natural control. We developed a laboratory exercise that allows students to conduct an open-ended inquiry-based laboratory exercise where students test the ability of dragonfly (Odonata: Libellulidae and Aeshnidae) larvae to consume mosquito larvae. Dragonfly larvae were locally collected using a D-frame net and mosquito larvae were obtained from a laboratory colony. Both dragonflies and mosquito larvae can also be acquired online. Students design an experiment using small cups and spring water into which they place a dragonfly larva and a number of mosquito larvae. Students record the timing of attack and the number of larvae consumed and compare their data with that of other students. Dragonfly larvae are effective predators of mosquito that quickly (< 20 minutes) consume 5-10 mosquito larvae under laboratory conditions. Students have successfully examined the influence of substrate, water depth, presence of vegetation, and family of dragonfly on predation. Students gain an appreciation of ecology and food-webs that are positively influenced by mosquitoes while conducting these laboratory experiments. This exercise is being developed for publication and is suitable for entomology, general biology, and ecology.

P2-12. Acaricide target gene sequences in the cattle tick, *Rhipicephalus (Boophilus) annulatus.*

Hannah Moreno (hannah.moreno01@utrgv.edu)[1], Jason Tidwell[2], Guilherme Klafke[3], Robert J. Miller[2] and Adalberto A. Pérez de León[4], [1]UTRGV, Edinburg, TX, [2]USDA - ARS, Edinburg, TX, [3]USDA-ARS Cattle Fever Tick Research Laboratory, Edinburg, TX, [4]USDA - ARS, Kerrville, TX

Acaricide resistance complicates efforts to control or eradicate ticks of veterinary importance like the cattle tick, *Rhipicephalus* (*Boophilus*) *annulatus* which has recently developed resistance to pyrethroids. By comparison, *Rhipicephalus microplus*, a tick closely related to *R. annulatus*, has shown resistance to multiple acaricides that target different receptors in the central nervous system, including voltage-gated sodium channels, gamma-aminobutyric acid (GABA)-gated chloride channels, and octopamine receptors. Single point mutations were found in these genes that correlate to acaricide resistance in *R. microplus*. In this study, we are the first to sequence whole transcripts of these acaricide target genes in *R. annulatus*. We present the results of our research here.

Student Competition - Master's Posters

P3-1. *Aschersonia* and other fungal pathogens of Hemiptera from Mexico, and their activity against whiteflies (Aleyrodidae).

Renato Villegas-Luján (renato_villegas1988@hotmail.com)[1], Reyna Torres-Acosta[2] and Sergio Sanchez-Peña[2], [1]Universidad Autonoma Agraria Antonio Narro, Saltillo, Mexico, [2]Universidad Autónoma Agraria Antonio Narro, Saltillo, Mexico

Several members of the Hemiptera are key plant pests. The brightly-colored fungus *Aschersonia* and related fungi in the Hypocreales include specific entomopathogens of Hemiptera (Sternorrhyncha) like scale insects, mealybugs and whiteflies. These specific fungi have no impact on natural enemies and non-target insects, and can have potential as biological control agents. We isolated *Aschersonia aleyrodis*, *Aschersonia turbinata* and related fungi from mycosed hemipterans from field collections at Tamaulipas and Veracruz, Mexico. The pathogenicity of *A. aleyrodis* against nymphal *Trialeurodes vaporariorum* (greenhouse whitefly) was tested under in vitro conditions.

The culture medium used for isolation was PDA enriched with yeast extract (0.5%), amended with cetyltrimethylammonium bromide (CTAB, 0.15 g/l) and oxytetracycline (200 µg/ml). Three spray applications have been made so far: First: against nymphs (first-third stage) on tomato leaves at a concentration of $7.5X10^7$ conidia/ml; second: against third stage nymphs on potato leaves at $2X10^8$ conidia/ml; and third: against second and third stage nymphs on citrus leaves at $1.1X10^8$ conidia/ml. Mortality levels (%) for trials were: up to 36.5%, 83% and 77% respectively. These levels confirm that effect is dose-dependent. Results from bioassays using other fungi against additional hemipterans will be presented. These entomopathogens should be investigated as biological control agents of whiteflies and other Hemiptera.

P3-2. Investigating the thermal limits and requirements that affect the biology of the sugarcane aphid, *Melanaphis sacchari*, (Zehntner, 1897).

Misael de Souza (misael.de_souza@okstate.edu)[1], W. Wyatt Hoback[2], J. Scott Armstrong[3] and Phillip G. Mulder[2], [1]Oklahoma State Univ., STILLWATER, OK, [2]Oklahoma State Univ., Stillwater, OK, [3]USDA - ARS, Stillwater, OK

The sugarcane aphid, which is native to tropical areas of Africa has rapidly spread into grain sorghum in south and east Texas, southern Oklahoma, eastern Mississippi, northeastern Mexico, and central, northeast, and southwest Louisiana causing an economic loss of more than $23 million in 2014-2015. A major factor involved in the rapid spread of this aphid pest is its high reproductive rate during optimal temperatures. Understanding the thermal limits (i.e. the lower and upper threshold temperatures) as well as the optimal temperatures for maximal growth and development of sugarcane aphid populations can be helpful in predicting economic impacts. We tested aphid survival and reproduction at 5, 10, 30 and 35 C on a susceptible sugarcane hybrid. Aphids died without reproduction at 5 C. Very little reproduction occurred at 10 and 35 C and aphids died within a week. At 30 C, all aphids survived and reproduced. We are conducting follow up experiments to determine the thermal limits for survival of the sugarcane aphid.

P3-3. Abundance of native bees and managed honey bees across pumpkin fields on the Texas High Plains.

Christopher Jewett (christopher.jewett@ttu.edu) and Scott Longing, Texas Tech Univ., Lubbock, TX

Cucurbita pepo cultivars such as pumpkins have long been a specialty crop on the Texas High Plains. Pumpkin production requires the input of bee pollinators; pumpkin producers typically rent managed honey bees from outside the region for pollination services. However, little is known about the occurrences or contributions of native bees to these services. In this study we partnered with three pumpkin producers in Floydada, Texas to investigate occurrences and abundances of different bee pollinators in pumpkins. We conducted transect surveys across 12 pumpkin fields, seven with managed honeybee colonies, three with *Bombus impatiens* colonies, and two farms with no managed bees. *Peponapis pruinosa* dominated the total abundances of bees across the pumpkin fields, even with the presence of managed hives. Sixty-nine percent of the total number of bees counted were *P. pruinosa*, while only 0.20 and 29.80 percent were managed bumble bees and honey bees, respectively. Across the growing season, *P. pruinosa* were more abundant early in the season and abundances declined in relation to the flowering phenology of pumpkin plants. Managed honey bees showed spiked abundances on individual cultivars, but abundances of managed bees were consistently lower than that of native bees. Additional field studies in 2017 will be conducted to further investigate abundances, dispersion and nesting of native bees associated with pumpkin production on the Texas High Plains.

P3-4. Demystifying kissing bugs for a broad audience: Identification guide to Chagas disease vector species of the United States (Hemiptera: Reduviidae: Triatominae).

Justin Bejcek (jbejcek13@tamu.edu)[1], Gabriel Hamer[2] and Sarah Hamer[2], [1]Texas A&M Univ., Celina, TX, [2]Texas A&M Univ., College Station, TX

Chagas disease is caused by *Trypanosoma cruzi*, the protozoan parasite vectored by the subfamily Triatomine, which are known as conenose bugs or kissing bugs. Chagas is considered a neglected tropical disease, with an estimation of 6 to 7 million people being infected worldwide, with most cases occurring in Central and South America. The awareness for Chagas disease is increasing, including the acknowledgement of locally-acquired human and canine cases in the Southern U.S. Accordingly, a recent “media epidemic” of Chagas disease in the U.S. has generated heightened interest among public communities, medical, veterinary, and pest professionals. Our ongoing research and program involves receiving kissing bug submissions from the public, which has revealed persistent misidentifications, despite our online resources helping with identification. Both individuals with or without entomological expertise have difficulty distinguishing blood-feeding *Triatoma* spp. from similar looking Hemipterans and other common insects. Our project has prepared a series of resources, from comprehensive dichotomous keys to one-page flyers and posters that attempt to allow the user to navigate from insect order down to the 11-bloodfeeding species that occur in the U.S. The broad audience of these resources includes concerned parents, local public health workers, medical and veterinary professionals, and professional pest managers. Ensuring the proper identification of a suspected kissing bug is the first step in an integrative vector management program.

P3-5. Determining the functional morphology of the eggs of *Sinea* spp. (Heteroptera: Reduviidae).

Danielle Lara (djessie@nmsu.edu) and C. Scott Bundy, New Mexico State Univ., Las Cruces, NM

Assassin bugs are predatory insects that are opportunistic feeders and can be found in many environments. Members of the genus *Sinea* have been studied in the Midwestern U.S., but little research has been conducted for the species that are present in the Southwest, including studies on their eggs. The current research examines the novel functional morphology of the eggs of *Sinea.* These eggs have a collar surrounding the operculum, which exhibits a mechanical response similar to the opening/closing of some flower species; this is odd because the structures comprising the egg are non-living. This response previously has been reported in one species, but the mechanism by which it functions is not understood. Our preliminary data shows this response occurs in multiple species and suggests the movement could be related to moisture. A series of lab experiments have been conducted along with detailed examination of the morphology of the egg to determine how this process works. Presented here are the results of this ongoing study.

P3-6. The reproductive potential of the sugarcane aphid on susceptible and resistant sorghums from the Lubbock USDA-ARS germplasm

Ankur Limaje (ankur.limaje@gmail.com)[1], Chad Hayes[2], J. Scott Armstrong[3], W. Wyatt Hoback[1], Ali Zarrabi[1], Sulochana Paudyal[1] and John Burke[2], [1]Oklahoma State Univ., Stillwater, OK, [2]USDA-ARS, Lubbock, TX, [3]USDA - ARS, Stillwater, OK

The sugarcane aphid, *Melanaphis sacchari*, was discovered infesting grain sorghum in the southern United States in 2013 and has been a perennial pest through 2016. Our goal is to identify sorghum germplasm that exhibits host plant resistance to the sugarcane aphid. We originally screened 36 lines including 2 known resistant sorghums (TX2783 and DKS-37-07) and 2 known susceptible sources (MORHC858 and WSH117). From this screen, two pollinator lines R.11143 and R.11259 developed by the USDA-ARS in Lubbock, TX in 2011 exhibited resistance to the sugarcane aphid. Our next step was to identify the mechanisms of host plant resistance, which involved determining sugarcane aphid reproductive potential. We report here that 2 pollinator lines R.11143 and R.11259 had significantly lower reproductive potential than all entries with the exception of the resistant check TX2783. Females reared on R.11143 and R.11259 had a net reproduction (*Md)* of 14.2 and 22.5, which was not significantly different than the resistant check TX2783, but significantly lower than all other entries. The intrinsic rate of increase (*rm*) was also lower for R.11143 (0.21), R.11259 (0.26), and TX2783 (0.19) indicating that as a group, antibiosis is part of the resistance expressed from these lines. Pollinators R.11143 and R.11259 can be used in breeding programs for developing resistant sorghums threatened by the sugarcane aphid.

P3-7. Late season surveys reveal activity of American burying beetles (*Nicrophorus americanus)* in Oklahoma.

Dan St. Aubin (danbs@okstate.edu)[1] and W. Wyatt Hoback[2], [1]Oklahoma Satte Univ., Stillwater, OK, [2]Oklahoma State Univ., Stillwater, OK

The federally endangered American burying beetle (ABB), *Nicrophorus americanus*, is Oklahoma's only endangered insect. Camp Gruber, an Army National Guard training base in Muskogee County, OK, has one of the state's largest populations of ABB. We used carrion-baited pitfall traps to sample for presence of ABB. The traps were placed in a variety of habitat types, and checked in the mornings in bi-weekly intervals from late-July through October. We trapped 607 ABB and captured beetles on October 30, 2016 which is the latest activity record in the United States. All beetles were sexed and sex ratios were examined for all dates. Overall, 61 percent of ABB sampled were female; however, sex ratios varied across the season. Infection with *Wolbachia* bacteria has been noted in causing feminization of other insects suggesting an opportunity for future research. We also documented 1,191 *N. Nicrophorus orbicollis*, 872 *Necroides surinamensis*, 373 *Nicrophorus pustulatus*, and 48 *Nicrophorus tomentosis*, providing insights into seasonal activity of the carrion beetle community. These data are important in determining ABB's seasonality and suggest late-season activity in appropriate weather conditions in the southern range. These data are crucial to modeling the effects of climate change on remaining populations of ABB.

P3-8. Screening of novel antigens for the control of *Boophilus microplus* through artificial feeding.

Charluz Arocho Rosario (marioli@tamu.edu)[1], Robert J. Miller[2], Pete Teel[3], Adalberto A. Pérez de León[4] and Felix Guerrero[4], [1]Texas A&M, college station, TX, [2]USDA - ARS, Edinburg, TX, [3]Texas A&M Univ., College Station, TX, [4]USDA - ARS, Kerrville, TX

The southern cattle fever tick (CFT), *Rhipicephalus (Boophilus) microplus*, causes many economic losses in cattle production. This species serves as a vector for diseases such as babesiosis and anaplasmosis, infecting livestock with these two major diseases. Unfortunately, ticks in many parts of the world are becoming resistant to the pesticides available in the market, leading to a need to develop new research techniques that identify more effective methods to control this species. Recent research has identified a vast dataset that can be mined to identify novel antigen candidates for the development of new anti-tick vaccines. This new information has lead to the development of a new vaccination that works in conjunction with a pesticide in order to increase its effectiveness against the control of the southern cattle fever ticks. The evaluation of this new approach involves vaccination of host animals followed by monitoring tick numbers on the cattle. Initial screening of the genome using specific criteria has identified 8 antigens that warrant further testing. Currently, 3 of these 8 antigens are ready for testing. Animal studies are costly, so we need to have an idea of what can be most effective before performing studies directly with them and thus reduce economic losses.

P3-9. Survival of stored-product psocids (Psocoptera: Liposcelididae) at 50% relative humidity.

Abena Ocran (abena.ocran@okstate.edu), George Opit, Kandara Shakya and Sandipa G. Gautam, Oklahoma State Univ., Stillwater, OK

The psocid species *Liposcelis entomophila* (Enderlein), *Liposcelis decolor* (Pearman), *Liposcelis bostrychophila* Badonnel, and *Liposcelis paeta* Pearman are well recognized stored-product pests that infest grain storage facilities and warehouses worldwide. Psocids are pests of substance and their economic importance is documented. Pest management practices designed to control coleopteran and lepidopteran pests have been less successful against psocids. Psocids are quite sensitive to low relative humidity. Therefore, moisture management and dehumidification can be effective alternative tools for their control. In the present study, we investigated the effects of 50% relative humidity on the survival of the above mentioned four *Liposcelis* species. Survival of all life stages of the four species of psocids at 50% and 75% RH was determined after 0, 2, 4, 8, 10, 12, 14, and 16 d at 30°C. At 50% RH, 100% mortality of all life stages of *L. entomophila*, *L. decolor*, *L. bostrychophila*, and *L. paeta* occurred after 10, 12, 14, and 16 d, respectively. Over the 30-d period of the experiment, at 75% RH, numbers of nymphs and adults of all the four species increased. These data indicate that dehumidification can potentially be used for psocid management.

P3-10. Synergism of pyrethroids with inhibitors in resistant bed bugs (*Cimex lectularius*).

Maria Gonzalez-Morales (mgonzal@nmsu.edu) and Alvaro Romero, New Mexico State Univ., Las Cruces, NM

The common bed bug, *Cimex lectularius* L. (Hemiptera: Cimicidae), is an obligate hematophagous insect that has resurged worldwide in the past 15 yr. Control of bed bugs is primarily based on intensive application of a limited number of insecticides, mainly pyrethroids. Broad application of these insecticides has led to the development of resistance to these compounds in bed bugs. Failure to eliminate resistant bed bugs could be a contributing factor for the spread of this pest. Therefore, effective management strategies of insecticide resistance in bed bugs need to be developed. We explored the use of synergists to understand the involvement of detoxifying enzymes in resistance and to evaluate their potential to overcome pyrethroid resistance. We used the cytochrome P450 monooxygenase (P450) inhibitor piperonyl butoxide (PBO) to assess the role of P450s in deltamethrin resistance in two field-collected bed bug strains, Jersey City and Cincinnati Piperonyl butoxide synergized deltamethrin in all two strains, but its impact was variable. The synergistic ratio varied from 64 in Jersey City to 7 in Cincinnati. The residual resistance after PBO treatment indicates that P450s contribute to but are not wholly responsible for deltamethrin resistance in bed bugs. Our data also suggest that other resistance mechanisms not mediated by P450s might be involved. The role of other detoxifying enzymes in pyrethroid resistance is being determined with other inhibitors.

Regular Posters

Regular poster presentations

P4-1. An evaluation of management tactics for sugarcane aphid (SA) *Melanaphis sacchari* (Zehntner) in Oklahoma grain sorghum *Sorghum bicolor* (L.), 2016.

Ali Zarrabi (ali.zarrabi@okstate.edu)[1], Tom Royer[1], Kris Giles[1], Norman Elliott[2], S. Seuhs[1], Jessica Lindenmayer[1] and Neda Ghousifam[1], [1]Oklahoma State Univ., Stillwater, OK, [2]USDA - ARS, Stillwater, OK

In cooperation with United Sorghum Checkoff, several management tactics were examined in 2016.

P4-2. *Cryptonevra nigritarsis*, (Chloropidae) a shootfly that infests invasive giant reed, *Arundo donax* (Graminae).

Donald B. Thomas (donald.thomas@ars.usda.gov) and John A. Goolsby, USDA - ARS, Edinburg, TX

Species of *Cryptonevra* are associates of the common reed (*Phragmites*). Recently we have found them infesting giant reed, *Arundo donax*. Among the Chloropinae the genus *Cryptonevra* can be distinguished by its black body (most species in this subfamily are yellow or reddish), males with a femoral comb, the arista not blade-like, the posterior femora not enlarged and the ocellar triangle without a central groove. Because the morphological differences among the adults of the named species are subtle and variable, and all species have been reported from the same host plant (*P. australis*), their status has been questioned, in particular the separation of *C. nigritarsis* and *C. flavitarsis*. Recently, Grochowska (2008) found significant differences in the larvae of *C. flavitarsis* compared to the third-instar larvae of *C. nigritarsis*. Accordingly, their validity as separate species is confirmed. Interestingly, Grochowska states that both species can be found together in Lipara galls and that there are only rare instances that *C. flavitarsis* can be found in non-gall decayed tissues of the plant. But with regard to *C. nigritarsis* Grochowska (2007) states "unlike *flavitarsis*, *C. nigritarsis* only sporadically occurs in galls of Lipara flies." She also says, "Nartshuk (1969) considered it to be a rare species. Based on those comments, the emerging picture is that the true host plant for *C. nigritarsis* is *A. donax* and that it is only adventitious on damaged tissues of *P. australis*.

P4-3. Fungi isolated from house flies (Diptera: Muscidae) on penned cattle in south Texas with comments on bovine ringworm.

Cherity Ysquierdo (cherity.ysquierdo@utrgv.edu)[1], Pia Olafson[2] and Donald B. Thomas[3], [1]The Univ. of Texas Rio Grande Valley, Brownsville, TX, [2]USDA - ARS, Kerrville, TX, [3]USDA - ARS, Edinburg, TX

Musca domestica L. were collected from cattle diagnosed with bovine ringworm to evaluate the potential of the house fly to disseminate *Trichophyton verrucosum* E. Bodin, a fungal dermatophyte that is the causative agent for ringworm in cattle. Fungal isolates werecultured from 45 individual flies on supplemented Sabouraud dextrose agar, and isolates were identified using morphological and microscopic approaches. Each isolate was identified further by PCR amplification of the ribosomal DNA locus with fungal specific primers and subsequent amplicon sequencing. Trichophyton verrucosum was not identified using these approaches. However, 35 different fungal species representing 17 genera were cultured from collected flies, including several species that are allergenic and pathogenic to humans and/or animals. Several species within the fungal orders Hypocreales, Microascales, Onygenales, Saccharomycetales, Xylaniales, and Agaricales were observed for the first time on house flies. The most frequent fungus recovered was *Cladosporium cladosporoides* Fresen, which is known to be a ubiquitous, airborne allergen to humans.

P4-4. Comparative melissopalynology to understand the foraging preferences of *Trigona iridipennis* Smith, from various altitudes of Kerala, India.

Deepthi T. R (deepthitrarun@gmail.com)[1] and Mary Painter[2], [1]N S S Hindu College, Kerala, India, Kottayam, India, [2]N S S Hindu College, Kerala, Kottayam, India

A comparative study on melissopalynology of *Trigona irridipennis* from different altitudes of Kerala was conducted from October 2014 – March 2015. The pollen analysis of honey samples from varying altitudes resulted in the identification of pollen grains of 21 plant species belonging to 14 families. Pollen spectra of honey revealed a variety of not only nectariferous but also nectarless sources available to bees. Out of 21 plant species 7 are nectar producing, 9 are pollen producing, 5 are both nectar and pollen producing. The plant species obtained from highland was found to be nectar rich whereas that from lowland was pollen rich and midland varieties were found to be intermediate from melissopalynological analysis. This study has also led to the identification of major plants visited by bees in this area. Therefore, there is the possibility of utilizing this rich bee flora of this zone for the development of apiculture in Kerala. Considering the medicinal value of honey of *T. iridipennis*, the knowledge of botanical origin of honey can also be applied to the emerging concept of construction of Bee Parks; an emerging concept and pioneer effort to conserve these bees.

P4-5. Control of cotton fleahopper with selected insecticides in cotton, 2016.

Suhas Vyavhare (suhas.vyavhare@ag.tamu.edu)[1], Adam Kesheimer[1] and Blayne Reed[2], [1]Texas A&M AgriLife Extension Service, Lubbock, TX, [2]Texas AgriLife Extension, Plainview, TX

In Texas, cotton fleahopper, *Pseudatomoscelis seriatus* (Reuter) (Hemiptera: Miridae), is a key insect pest of cotton with induced yield loss estimates of 0.4% over the past decade and was the leading cause of yield loss due to insect damage in Texas during 2012-2013. The cotton fleahopper can cause excessive loss of cotton squares resulting in reduced yield and harvest delays. Growers and consultants often rely on foliar insecticide applications for the control of cotton fleahopper. A field trial was conducted on commercial cotton field to gather insecticide efficacy data to help growers and consultants in selection of proper treatments. Products tested included conventional insecticides such as acephate (Orthene 97S), dicrotophos (Bidrin 8), sulfoxaflor (Transform 50WG), flonicamid (Carbine 50WG) and an insect growth regulator novaluron (Diamond). All of the insecticide treatments, except Diamond and Carbine at 10 days after treatment (DAT), resulted in significantly fewer cotton fleahopper nymphs on all sample dates. Application of insect growth regulator Diamond significantly reduced cotton fleahopper nymphs compared to the untreated check at 3 DAT, 7 DAT, 14 DAT, and 21 DAT. Overall, Carbine, Transform, Orthene, and Bidrin (rates for each are the highest labeled rates) provided excellent control of cotton fleahopper. Tank mixing Diamond with Orthene did not improve efficacy against cotton fleahopper compared to Orthene applied alone.

P4-6. Life history and varietal preference of *Erythroneura comes* (Hemiptera: Cicadellidae) in an Oklahoma vineyard.

Kevin Jarrell (kevin.jarrell@okstate.edu) and Eric Rebek, Oklahoma State Univ., Stillwater, OK

Eastern grape leafhopper, *Erythroneura comes* (Say), is an economically important pest of grapes in the northeastern and midwestern United States. The effect of temperature on life history of this insect was investigated in the summer of 2016 at an Oklahoma vineyard using an accumulating degree day (DD) model. The preference of *E. comes* for certain grape varieties was also investigated. Leafhopper populations were sampled using sticky cards, vacuum samples, and counts of nymphs occurring on leaves. Three peaks in nymph abundance occurred at June 9, July 22, and August 26, indicating three generations. By these dates, 1359 DD, 2786 DD, and 3922 DD had accumulated, respectively. Five grape varieties were represented: Chambourcin, Cynthiana, Frontenac-Gris, Niagara, and Noiret. Noiret had significantly more leafhoppers than all other varieties for sticky cards and vacuum samples. Life history data gathered in this study are the foundation for a more intensive investigation of the relationship between phenology of *E. comes* and temperature. Elucidating this relationship will allow for the development of integrated pest management protocols that are specific to Oklahoma.

P4-7. Evaluation of a potential new biological control agent of *Bactericera cockerelli.*

Gabriela Esparza-Díaz (gesparzadiaz@ag.tamu.edu)[1], Raul T. Villanueva[2], Joseph Munyaneza[3], David Horton[3] and Ismael E Badillo[4], [1]Texas A&M Univ., Weslaco, TX, [2]Univ. of Kentucky, Princeton, KY, [3]USDA-ARS, Wapato, WA, [4]Texas A&M AgriLife Research, Weslaco, TX

Bactericera cockerelli (Hemiptera: Triozidae) is the insect vector of the fastidious bacterium "*Candidatus* Liberibacter solanacearum" that causes diseases in several solanaceous crops, including zebra chip, an economically important disease of potato. Currently, vector and pathogen control relies extensively on the use of insecticides. However, alternative strategies of control are needed to effectively minimize losses caused by this vector-borne bacterial pathogen. *Nesidiocoris tenuis* (Hemiptera: Miridae) is a generalist insect predator frequently used in Europe to control several insect pests, including *Bemisia tabaci*. In South Texas, *N. tenuis* was recorded for the first time in 2013 as an exotic insect feeding on nymphs of *B. cockerelli*. Presence of *N. tenuis* over subsequent years has resulted in the establishment of this exotic insect in tomato and sesame crops in South Texas. Thus, the objectives of the present study were 1) to estimate the functional response of *N. tenuis* as a predator of *B. cockerelli* under laboratory and greenhouse conditions and 2) to evaluate the efficacy of *N. tenuis* control of *B. cockerelli* and its compatibility with a standard insecticide program under field conditions. Here we report the functional response and the changes in the population densities that occurred under three different conditions due to the interactions between predator and prey populations. Our results clarify the potential of *N. tenuis* to reduce populations of *B. cockerelli,* and open up the possibility of its mass release to control an important insect pest and disease vector.

P4-8. Further demonstration of widespread phosphine resistance in *Cryptolestes ferrugineus* (Coleoptera: Laemophloeidae) in Oklahoma.

Charles Konemann (charles.e.konemann@okstate.edu), George Opit and Zhaorigetu Hubhachen, Oklahoma State Univ., Stillwater, OK

Phosphine gas (PH_3) is one of the most commonly used fumigants for controlling stored grain pests worldwide. In 2013, we established a discriminating dose for *Cryptolestes ferrugineus* (Stephens) (Coleoptera: Laemophloeidae) to be 56.2 ppm of PH_3 over a 20-h exposure period. This discriminating dose was then used to detect PH_3 resistance in 13 field-collected populations of *C. ferrugineus* from Northcentral Oklahoma. Survival of *C. ferrugineus* populations tested ranged from 15.5–92%. During 2015 and 2016, 8 additional populations of *C. ferrugineus* from on farm, local cooperatives, and terminal grain storage facilities were collected, and a discriminating dose of 56.2 ppm was used to assess whether they had detectable resistance. Results from this test showed that PH_3 resistance appears widespread throughout Oklahoma. Three of the populations had resistance frequencies > 90% and these included populations from one terminal and two cooperative storage facilities. Resistance frequencies for *C. ferrugineus* from three other facilities tested ranged from 60–86 %, while populations from two remaining cooperative facilities demonstrated strong susceptibility (no detectable resistance) and had 100% mortality. Future work will focus on conducting dose-response tests on these eight populations to determine their LC_{99} values, as well as collecting more populations from on farm storage facilities and terminal elevators in order to continue assessing the extent of resistance to PH_3 in *C. ferrugineus* and other stored product pest species.

P4-9. Predation of sentinel eggs in cotton and sorghum in New Mexcio.

Jane Breen Pierce (japierce@nmsu.edu), Patricia E Monk and John Idowu, New Mexico State Univ., Las Cruces, NM

Cotton glands produce gossypol, a natural defense against insect pests. Glandless cotton varieties are available, but losses from pests have prevented commercial development. Some areas of New Mexico have lower insect pressure, with high predation and desiccation suppressing pest populations. With appropriate management and monitoring of insect pests, growers could potentially produce glandless varieties as a niche crop with greatly added seed value. Field to lab trials were conducted on New Mexico State University farms to evaluate predation rates in glandless vs. glanded cotton in an effort to develop pest management strategies. Sentinel cotton bollworm eggs were attached to glanded and glandless cotton plants on multiple dates in 2015 to 2016 to evaluate potential differences in predation. Insects were also sampled from plots weekly using sweep nets.

In 2016, unlike earlier years, there was only one date where sentinel eggs had significantly higher predation in Acala 1517-08 a glanded cultivar. More importantly, there was not significantly higher predation in the second glanded cultivar indicating that any differences are unlikely due to the presence of glands. Early flowering was recorded in 2016 as a possible explanation for higher spider presence in Acala1517-08 in 2015 but was not found to be significantly different. Direct observations of predators for 24 hours indicated that sweep net samples underestimate predation by a few important predators. Overall similarity in predation rates in glanded and glandless cotton suggests that predation will be an important source of control of insect pests in commercial glandless cotton production.

P4-10. Insect pest management in speciality crops using *Beauveria bassiana* and azadirachtin based commercial formulations.

Manuel Campos (mcampos@biosafesystems.com), BioSafe Systems, East Hartford, CT

Biological and Botanical (B/B) based insect pest control products have increasing acceptance in specialty crop protection due to their unique modes of action combined with non-toxic and low/non-residual nature. Success from use of these products depend primarily on understanding their specific modes of action, application program, inherent advantages and limitations and integration with the existing pest management programs. The objective of this presentation is to discuss technical details of commercial B/B formulations from BioSafe Systems based on Entamopathogenic fungus *Beauveria bassiana* and Azadirachtin, labeled for use in Insect pest management.

P4-11. Responses of blackmargined aphid (*Monellia caryella* (Fitch); Hemiptera: Aphididae) densities to seasonal changes in selected abiotic and biotic factors in pecan.

Tiffany Johnson (shimsham@nmsu.edu) and Brad Lewis, New Mexico State Univ., Las Cruces, NM

Blackmargined aphids, *Monella caryella* (Fitch), is the primary pecan pest in New Mexico. Previous field observations of blackmargined aphids have shown a bimodal population density distribution within a growing season and higher aphid densities in high-yield seasons compared to population densities in low-yield seasons. A field study was initiated in 2011 to determine if specific abiotic and biotic factors contribute to changes in blackmargined aphid densities in both high and low yield trees within the same growing season. Samples were collected from the field plots in 2012 and tissues (leaf and phloem) were analyzed in subsequent years (2013-2015).

No significant differences ($p \leq 0.05$) in aphid population densities between high-yield and low-yield pecan tree plots were measured. Data correlations did not support temperature, sunlight, beneficial insect populations, and changes in leaf tissue macronutrients as primary factors in aphid density changes. Results for environmental factors were supported by an environmental chamber study conducted in 2014, where blackmargined aphid, feeding on fresh pecan leaves, exhibited similar changes in fecundity as field populations despite their static environmental conditions. Of the 15 detected amino acids extracted from phloem of excised leaves, four (asparagine, methionine, glutamic acid, and isoleucine) were used in density correlations based on previously published research investigating amino acids and their impact on plant pests. Selected amino acids were found to have significant correlations with blackmargined aphid population densities in both high and low yield, suggesting that nutritional dietary factors may be a key element in population dynamics of blackmargined aphid.

P4-12. Electropenetrography of the mosquito, *Aedes aegypti*, feeding on humans.

Astri Wayadande (a.wayadande@okstate.edu) and Bruce Noden, Oklahoma State Univ., Stillwater, OK

The mosquito, *Aedes aegypti*, is an important vector of animal pathogens, including the Zika virus. To better understand how mosquitoes probe and feed in real time, adult *A. aegypti* were electronically recorded using electropenetrography (EPG) technology. Adult females 4-10 days post-ecosion were tethered with 0.001 in gold wire glued to the pronotum with a conductive glue. Tethered mosquitoes were recorded using an AC-DC monitor operated with 10 to 100 mV applied DC voltage and variable input impedences (10^6 to 10^9 Ri), while feeding on a human hand for 15-20 minutes or until completion of at least one successful blood meal. EPG waveforms were analyzed using Windaq software and compared at the different Ri levels. Analysis revealed that *A. aegypti* performs at least five separate waveform types, two of which correspond to stylet penetration in the skin, and one corresponds to ingestion of blood. Input impedence levels influence the R to emf responsiveness curve, with more emf component becoming evident at the higher Ri levels. A waveform library of A. aegypti at the different Ri levels is described and reported.

P4-13. Using a non-majors class to reduce entomophobia and increase entomophilia.

W. Wyatt Hoback (whoback@okstate.edu)[1] and Douglas Golick[2], [1]Oklahoma State Univ., Stillwater, OK, [2]Univ. of Nebraska, Lincoln, NE

Oklahoma State University offers a three credit hour non-majors course entitled, “Insects and Society”. The purpose of the class is to expose students to insect diversity and biology, how insect survive abiotic and biotic challenges, and how insects interact

Poster Abstracts P4-10—P4-13

with humans. Both positive interactions (ecosystem services, pollination, aesthetic values) and negative interactions (disease transmission and crop loss) are presented. In the fall semester of 2016 we conducted pre- and post- surveys of 350 students enrolled in the lecture-only course to gauge interest, knowledge, and attitudes towards insects. A Likert scale was used to gage student comfort with interacting with insects (view, touch, consume), knowledge of the role of insects in history, and students attitudes about insects (fear versus preservation). Generally as students learned more about the role of insects, they also became more interested and more willing to interact with the insects. The goal of offering a class like Insects and Society is to increase awareness and interest in entomology and comfort to interact with insects. As a result, student knowledge of biology and science in general increases, hopefully leading to better prepared, scientifically literate graduates.

P4-15. Toxicity of abamectine and buprofezin, on homosigotic lines of *Trichogramma pretiosum* Riley (Hymenoptera: Trichogramatidae) under laboratory conditions.

Antonio Orozco (orozco_plancarte@hotmail.com)[1], Omegar Hernández[1], Ernesto Cerna[2], Yisa Ochoa[1], Juan Delgado[1] and Maria Orozco[1], [1]Universidad Autonoma Agraria Antonio Narro, Saltillo, Mexico, [2]Universidad Autónoma Agraria Antonio Narro, Saltillo, Mexico

Trichogramma pretiosum R. is a cosmopolitan parasitoid wasp of lepidopteran eggs, this species is widely used in biological control programs and however the indiscriminate use of insecticides has toxic effects on natural enemies, which may prevent the success of this management strategy. Therefore, it is necessary to know the risks and selectivity of these products, with the objective of evaluating the selectivity of Abamectin and Buprofezin on homozygous lines of *T. pretiosum* under laboratory conditions. For the development and increase of the pure lines, *Sitotroga cerealella* eggs were used as substrate, the selectivity of Abamectin and Buprofezin (500 ppm) was evaluated on 23 homozygous lines, and also 3 combinations of *T. pretiosum*; the parasitism, hatching and mortality of each of the different stadium were evaluated. The results indicate that both of the products present significant differences in the evaluated parameters.

P4-16. Morphometrics of the southern green stink bug stylet bundle.

Jesus F. Esquivel (jesus.esquivel@ars.usda.gov)[1], Robert Droleskey[2] and Roger Harvey[2], [1]USDA, ARS, Insect Control and Cotton Disease Research Unit, College Station, TX, [2]USDA, ARS, Food & Feed Safety Research Unit, College Station, TX

Southern green stink bugs and related crop pest species utilize a stylet bundle to penetrate the walls of developing fruit and ingest food resources; simultaneously, these insects can also introduce disease-causing plant pathogens. Southern green stink bugs can ingest multiple types of pathogens but only select pathogens are subsequently transmitted to plants. This report presents data regarding the morphometrics of the stylet bundle and their potential role in transmission of select plant pathogens.

P4-17. The short term impact of the Las Conchas Fire (2011) on ant communities in the Valles Caldera National Preserve.

Jonathan Knudsen and **Robin Verble** (robin.verble@ttu.edu), Texas Tech Univ., Lubbock, TX

Wildfires are natural and important disturbance in many ecosystems throughout the United States of America. Historic fire suppression and changing climate creates conditions for unusually large fires to occur. Fires impact local ecosystems, with many species adapted to take advantage of the changes in vegetation structure, soil nutrients, and food availability. Ants fill a variety of roles in their ecosystems, changing soil chemistry, dispersing seeds, and are a key food source for multiple species. We are examining the short term effects of the 2011 Las Conchas Wildfire on ant abundance and activity in the Valles Caldera National Preserve (Jemez Springs, NM, USA) among a trio of vegetation types (Montane Valleys, Mixed Conifer forests, and Ponderosa Pine forests) and four categories of fire severities (high, medium, low and unchanged). We are currently analyzing short-term trends (<6 months) in community structure, species richness, composition, abundance, and activity level among burned and unburned sites within the Preserve. We have found a total of 42 species distributed throughout the preserve, with montane valleys having higher species richness than any other vegetation type.

P4-18. Records of western bean cutworm, *Striacosta albicosta*, as a primary pest of corn ears in Mexico.

Sergio Sanchez-Peña (sanchezcheco@gmail.com)[1], Moises Felipe-Victoriano[2], Renato Villegas-Luján[2] and Esmeralda Gonzalez-Gallegos[2], [1]Universidad Autónoma Agraria Antonio Narro, Saltillo, Mexico, [2]Universidad Autonoma Agraria Antonio Narro, Saltillo, Mexico

The western bean cutworm, *Striacosta albicosta* (Lepidoptera: Noctuidae) is a moth native to the southwestern USA that is acting as an expanding, emergent pest on the eastern corn belt of North America. Previous to the present decade, this insect had not been reported as a corn pest in Mexico. There are now two reports of economically infested fields in this country; one near Mexico City, and one in Coahuila state, northern Mexico. At this last site (Huachichil, Coahuila, Mexico), a field at 2100 meters above sea level (masl) has been severely infested, in late fall of 2015 and 2016. General aspects of this last site and infestation are presented. Collected late instar larvae apparently went into diapause as prepupae in the laboratory. Two additional noctuid corn pests, collected at the same field either do not diapause (fall armyworm, *Spodoptera frugiperda*) or diapause as pupae (corn earworm, *Helicoverpa zea*). The insect is absent from nearby corn fields at lower elevations (1600-1800 masl) and confirmedly absent over years of collecting from commercial corn fields at Saltillo, at 1600 masl and 50 km distance. The larvae of *S. albicosta* are rather similar to fall armyworm larvae (which is very prevalent in Mexico) and this could lead to misidentifications. Further sampling should be made of this potentially destructive corn pest throughout Mexico.

P4-19. Laboratory bioassays of entomopathogenic fungi against *Melanaphis sacchari.*

Karla Cruz-Aldaco (aldacokarla@gmail.com)[1], Gabriela Esparza-Díaz[2], Raul T. Villanueva[3], Richard Humber[4] and Sergio Sanchez-Peña[1], [1]Universidad Autónoma Agraria Antonio Narro, Saltillo, Mexico, [2]Texas A&M Univ., Weslaco, TX, [3]Univ. of Kentucky, Princeton, KY, [4]USDA - ARS, Ithaca, NY

Six species of entomopathogenic fungi in the genera *Beauveria*, *Metarhizium*, and *Isaria* were evaluated against sugarcane aphid *Melanaphis sacchari* (Hemiptera: Aphididae) in laboratory bioassays at the Texas A&M AgriLife Research and Extension Center in Weslaco, Texas. Three strains were tested under greenhouse conditions. In both greenhouse and laboratory, we applied fungal suspensions of 1X 10^8 conidia/ml with 0.02% surfactant. Controls were surfactant and water alone (absolute control). In the laboratory, the fungal suspension was applied on a 20 mm diam. sorghum leaf disk and air dried and ten *M. sacchari* adults were placed on the leaf disk. Mortality was evaluated at 24, 48, and 72 h. In the greenhouse, we applied fungal suspensions on plants with *M. sacchari* populations. In the laboratory, mortality levels (at 72 h) for *B. bassiana*-2879, *B. bassiana*-2336, *M. brunneum*-3738, *Isaria* (3322, 5260 and 7028), surfactant solution, and water were 90, 87.5, 82, 86, 76 65.5, 55.5 and 45.2%, respectively ($F_{7, 126}$ = 12.96; p < 0.0001). In the greenhouse *M. brunneum*-3738 had the lowest aphid population of 12.2 aphids/plant ($F_{3,122}$ = 6.13; p = 0.0006). *Metarhizium brunneum*-3738 and *B. bassiana* (2879, 2336) were virulent strains that could have potential to reduce aphid densities. Mortality is evident after 72 hours in the laboratory; in the greenhouse (and probably in the field) these effects take a longer time. These fungi should be evaluated in a comprehensive way against sugarcane aphid in the field.

P4-20. Spotted alfalfa aphid (SAA) control: A look at conventional vs. unconventional products.

S. Seuhs (k.seuhs@okstate.edu)[1], Ali Zarrabi[1], Audrey Arant[2], Jenna Tuggle[2], Anna Hammons[2], Maggie Edwards[2], Kylie King[2] and Phillip G. Mulder[1], [1]Oklahoma State Univ., Stillwater, OK, [2]Oklahoma School of Innovation and Experiential Learning, Bixby, OK

Growth chamber experiments were established to examine efficacy of conventional products for spotted alfalfa aphid (SAA) control vs. non-conventional products such as safer soap, neem oil, and a mix of ground hot peppers. The alfalfa plants were grown in standard growth chamber 28° C. The test was replicated ten times for each treatment and a control. After applying aphids (2-3/plant), counts were taken two weeks later to determine product efficacy. Analysis showed conventional products with the best control, however, all products kept numbers below that of untreated plants.

P4-21. Cotton fleahopper management under varying irrigation water levels in the Texas Southern High Plains.

Megha Parajulee (m-parajulee@tamu.edu), Texas A&M AgriLife Research, Lubbock, TX

A field study was conducted at the AG-CARES research farm, Lamesa, Texas, to determine the effect of two irrigation levels (low and high) on cotton fleahopper-induced fruit loss and resulting cotton yield when exposed to varying cotton fleahopper densities. Cotton cultivars were planted under a center pivot modified to provide “low” and “high” irrigation treatments. Field collected cotton fleahopper adults were released onto cotton squares in multi-plant cages. Cotton fleahopper nymphs were released onto uncaged plants. Three cotton fleahopper density treatments included 'high' (5 fleahoppers per plant), 'low' (2 fleahoppers per plant), and an uninfested control. Released cotton fleahoppers were allowed to feed for one week to mimic a natural early-season acute infestation. After one-week feeding period, cages were removed and plants were sprayed with Orthene® 97UP. Pre- and post-plant mapping were conducted to monitor fruiting patterns. The highest lint yield was recorded in control treatment, followed by low cotton fleahopper density, and the lowest lint yield was recorded in the high cotton fleahopper density treatment. Significantly more lint yield was recorded from 'high' irrigation plots compared with 'low' irrigation plots. Cotton variety DP1454 had a significantly higher yield compared to FM2011.

P4-22. Evaluation of thrips damage potential in Texas Southern High Plains cotton.

Abdul Hakeem (abdul.hakeem@ag.tamu.edu)[1] and Megha Parajulee[2], [1]Texas AgriLife Research, Lubbock, TX, [2]Texas A&M AgriLife Research, Lubbock, TX

Field and greenhouse studies were conducted at the Texas A&M AgriLife Research and Extension Center Lubbock, Texas, to quantify the damage potential of thrips on seedling cotton. In the greenhouse study, 0, 0.5, 1 and 2 thrips per plant were released at 1- to 2- true-leaf stage. Similar densities were achieved in field cages via thrips release in No-Thrips® cages to compensate for 80% field mortality. Significant number of thrips were recovered from all thrips-augmented treatments, with lowest numbers recovered from control plants. Leaf area was significantly higher in uninfested control plots compared to those in thrips-augmented treatments. Seedling health declined progressively with increased thrips densities. Thrips densities at 0.5 thrips per plant or greater significantly reduced plant vigor. Thrips densities of 0.5, 1, and 2 per plant at early seedling stage all reduced lint yield significantly compared to that in uninfested control plots.

INDICES

* presenting

Author Index

Abdou Kadi Kadi, Hame P1-1*
Adams, Dayvion P2-6*
Adkins, Scott 8-7
Aguero, Carlos 3-14*
Allen, Charles 9-5*
Allen, Robert 7-7*
Anderson, David 6-9
Antwi, Josephine 3-7
Arant, Audrey P4-20
Armstrong, J. Scott P3-2, 3-7, 3-9, P3-6
Arocho, Charluz 6-13
Arocho Rosario, Charluz P3-8*
Arthurs, Steven 8-1*
Ashour, Mohammed 7-9*
Badillo, Ismael E P4-7
Badillo-Vargas, Ismael E. 8-7*
Bagnères, A. G. 2-7
Barbosa, Mark P2-2*
Behmer, Spencer T. 2-6
Beier, Ross 6-8
Bejcek, Justin P3-4*
Bennett, John P2-8
Bernal, Julio S. P1-2
Beskin, Kelly 7-5*
Biles, Stephen 11-4*
Black, Kelli P2-5
Bogran, Carlos 8-6*
Bolling, Bethany 10-7
Bonjour, Edmond L. 11-9*
Bouchebti, Sofia 2-10
Bowling, Robert 3-16, 11-4
Bradley, Kristy 6-6
Bradt, David 6-6*
Brewer, Michael 11-8, P1-2, 11-4
Brown, Sebe 3-16
Brown, Wizzie 10-7, 5-8*
Bryant, Vaughn 1-2, 3-10
Bulmer, Mark S. 3-14
Bundy, C. Scott P3-5, 11-10*
Burke, John P3-6
Bynum, Ed. 9-3
Cammack, Jonthan 7-4*
Campos, Manuel P4-10*, 11-5*
Cerna, Ernesto P4-15
Chau, Amanda 8-5
Chen, Mei-Er 2-3
Chow, Andrew 8-5
Cigliano, Maria Marta 4-2
Cole, Blaine J. 2-1*
Cosper, Derek P2-10*
Costet, Laurent 3-7
Crippen, Tawni 6-1
Crippen, Tawni L. 3-1, 6-2, 6-5, 6-8*
Crone, Makaylee 1-9*, 1-3
Cruz-Aldaco, Karla P4-19*
Davis, Bob 5-5*
de Souza, Misael P3-2*
Dearth, Robert 4-9
Dedeine, Franck 2-7
Delgado, Juan P4-15
Dever, Jane 8-2
Discua, Samuel 3-13*, P2-8, P2-9, P2-7
Donaldson, Taylor 3-8*
Droleskey, Robert P4-16
Dubie, Trisha P2-3, 10-4*
Dussutour, Audrey 2-6
Dzialowski, Andrew 4-3
Easterling, Brad 9-8*
Edwards, Maggie P4-20
Elliott, Norman P4-1, 3-16, 11-8*
Engler, Kim 5-6
Esparza-Díaz, Gabriela P4-7*, P4-19
Espinoza, Elida 3-1*
Esquivel, Jesus F. P4-16*
Falokun, Olalekan 1-9, 1-3*
Faris, Ashleigh 3-18*
Farriester, Jacob 4-6*

* presenting

Felipe-Victoriano, Moises P4-18
Fisher II, Adrian 1-9, 3-15*, 1-3
Fitzgerald, Maegan 3-18
Foquet, Bert 1-6
Frank, Steven 3-11
Freeman, Lexi 4-5*
Funderburk, Joseph E. 8-7
Garcia, Loriann 1-8
Garza, Christopher 2-9
Gautam, Sandipa 6-3
Gautam, Sandipa G. P3-9
Ghousifam, Neda P4-1
Gilbert, Lawrence E. 2-2
Giles, Kris P4-1, 3-4, 11-3*, 11-8, 3-16, 3-9, 3-11
Gold, Roger 3-1, 5-7
Golick, Douglas P4-13
Golnar, Andrew P2-6
Gonzales, John David 4-8*
Gonzalez, Alejandra 2-9
Gonzalez-Gallegos, Esmeralda P4-18
Gonzalez-Morales, Maria P3-10*
Goolsby, John A. P4-2
Gray, Helen 2-10
Graystock, Peter 2-11
Grozinger, Christina M. 3-5
Gu, Mengmeng 5-1
Guerrero, Felix P3-8
Guevara, Bryan P2-9, P2-7*
Hairgrove, Thomas 6-9
Hakeem, Abdul 8-2*, P4-22*
Hamer, Gabriel P2-6, 10-3*, P3-4
Hamer, Sarah 10-1*, P3-4
Hammons, Anna P4-20
Hanson, Steve F. 8-4*
Harvey, Roger P4-16
Hawkings, Chloë 1-1, 3-2*
Hayes, Chad P3-6
Hays, Samantha 6-9*
Heather, Jordan 6-1
Heinz, Kevin 8-1, 8-5*
Hernández, Omegar P4-15
Hess, Thomas P2-11*
Hildinger, Emily 1-2*
Hinson, Philip 4-7*
Hjelmen, Carl 3-17*
Hoback, W. Wyatt P3-7, 4-5, P3-6, P4-13*, 6-6, 4-3, P2-11, 4-6, 1-4, P3-2
Holcomb, Chelsea 7-3*
Holt, Jocelyn R. 3-7*
Horton, David P4-7
Hosoda, Ed 6-3
Hubhachen, Zhaorigetu P4-8, 6-3*
Huff, Eva P4-14*
Humber, Richard P4-19
Hurley, Janet 5-3*
Idowu, John P4-9
Jackson, Sydney 1-8
Jarrell, Kevin P4-6*
Jessie, Casi N. 11-3
Jessie, William 11-3
Jewett, Christopher P3-3*
Johnson, Tiffany P4-11*
Johnston, J. Spencer 3-17
Jones, Brittny 7-2*
Jonsson, Nicholas 6-11
Jordan, Heather 7-13
K. Tomberlin, Jeffery 7-1*
Kard, Brad 2-8
Kaspari, Michael 3-12
Kattes, David H. 10-6*, P2-1
Kazmaier, Richard T. 11-1
Keck, Molly 10-7, 9-6*, 7-8*, 5-6*
Keefer, Chris 5-7
Kerns, David 11-6, 4-8
Kesheimer, Adam P4-5
Kesheimer, Katelyn 9-3*
Kilpatrick, Shelby 1-6*
Kim, Dongmin 6-5*
Kim, Hee 6-7*
King, Kylie P4-20
Klafke, Guilherme P2-12, 6-11*
Knudsen, Jonathan P4-17
Knutson, Allen 3-16
Konemann, Charles 6-3, 2-8*, P4-8*
Krauter, Peter 8-5
Krejci, Cassie 5-7*
Lara, Danielle P3-5*

* presenting

Lau, Pierre 1-2, 1-9, 3-10*, 1-3
Leal, Brenda 4-9*
LeBrun, Ed 2-2*
Lesne, Pierre. 2-6*
Lewis, Brad P4-11
Limaje, Ankur P3-6*, 3-9
Lindenmayer, Jessica 3-16*, P4-1
Long, James 4-3
Longing, Scott. P2-7, 3-13, P3-3, P2-8, P2-9
Longnecker, Michael 3-8
Lopez, Job 6-7
Ma, Rong 3-5*, 2-11
Martin, Jason 3-14
Mashlawi, Abadi. 6-1*
McCornack, Brian. 3-16
McDowell, Bryant 4-1*
McFrederick, Quinn 2-11
McIntyre, Nancy. 3-13
McLaren, Neal 3-7
McPherson, J.E. 11-10
Medeiros, Matthew P2-6
Medina, Raul F.. 3-7
Merchant, Michael 5-1, 5-4*, 10-7
Miller, Robert J. P3-8, P2-12
Miller, Robert John. 6-4, 6-13*, 6-11
Mitchell, Forrest. 8-3*
Monk, Patricia E P4-9
Moran, Nancy. 2-12
Moreno, Hannah P2-12*
Morris, Xandra 9-9*
Mueller, Ulrich G.. . . . . 2-11*
Mulder, Phillip G. P4-20, P3-2
Munyaneza, Joseph P4-7
Mustard, Julie. 1-3, 1-9
Nagy, Mark 7-10*
Nash, Bret. 1-5*
Newton, Joy 11-1*
Nibouche, Samuel 3-7
Noden, Bruce P4-12, P2-3, 10-2*, 6-6, P2-11
Ochoa, Yisa P4-15
Ocran, Abena P3-9*
Olafson, Pia 6-10*, P4-3
Oliver, Robert 7-11*
Opit, George. 6-3, P4-8, P3-9
Orozco, Antonio P4-15*
Orozco, Maria. P4-15
Oswald, John D. 7-6
Ottens, Kristina. 2-2
Painter, Mary P4-4
Parajulee, Megha. P4-21*, 8-2, P4-22
Patel, Payal 1-8*
Paudyal, Sulochana 3-9*, P3-6
Payton Miller, Tracey 3-11*
Peavy, Don 7-12*
Pendleton, Bonnie P1-1, 4-7
Perdereau, Elfie 2-7
Pérez de León, Adalberto A. 6-7, P2-12, 6-11, P3-8, 6-13, 6-4
Peterson, Gary 3-7
Phoofolo, Mpho 11-8
Pickens, Victoria. 1-4*
Pierce, Jane Breen P4-9*
Pietrantonio, Patricia 2-3*
Porter, Patrick. 9-3
Prather, Rebecca 3-12*
Pruter, Luke P1-2*
Puckett, Robert 4-1, 5-2*, 6-2
Rangel, Juliana 3-5, 1-3, 1-2, 2-9*, P2-2, 3-15, 3-10, 1-9
Raszick, Tyler 3-6*
Raymann, Kasie 2-12*
Rebek, Eric P4-6, 11-2*, 3-11
Reed, Blayne. P4-5, 9-2*, 9-3
Reed, Melissa 4-3*
Rich, Brian 6-4*
Risser, Kyle 3-4*
Romero, Alvaro P3-10
Romero-Castillo, Alvaro 4-4*
Roper, Colin 1-1*
Royer, Tom P4-1, 3-16
Sanchez, Daniela 6-11
Sanchez-Peña, Sergio. P4-18*, P1-3, 4-4, P4-19, P3-1
Schnelle, Mike 3-11
Seal, Jon 2-4*
Seeley, Thomas D. 2-9

* presenting

Seiter, Nicholas . . . 3-16
Selking, Ryan . . . 4-2*
Seuhs, S. . . . P4-20*, P4-1
Shaffer, Zack . . . 2-12
Shakya, Kandara . . . P3-9
Sheffield, Cynthia L. . . . 6-8
Sherrill, Kylie . . . P2-5
Sidwa, Tom . . . 10-7
Simcock, Nicola . . . 2-10*
Sissom, W. David . . . 11-1
Smith, Britt . . . 3-3*
Smythe, Brandon . . . P2-10, 1-7, 6-12*
Snethen, Daniel G. . . . 4-6
Soltero, Fred . . . 6-13
Song, Hojun . . . 4-2, 1-6
Spindola, Aline . . . 7-6*
St. Aubin, Dan. . . . P3-7*
Strey, Otto . . . 3-8
Styer, Alex . . . 3-7
Sweeney, Jennifer H. . . . 6-2*
Swiger, Sonja L.. . . . 6-10, 10-7*, 9-4*, 6-9
Szczepaniec, Ada . . . P2-4, P4-14, 11-7*
T. R, Deepthi . . . P4-4*
Talley, Justin . . . 10-8*, P2-5
Tamborindeguy, Cecilia . . . 3-2, 2-3, 1-1
Tarone, Aaron . . . 1-2, 3-1, 3-18
Taylor, Melise . . . 11-10
Teel, Pete . . . 6-4, 6-9, P3-8, 6-7, 3-8, 10-5*
Thomas, Don . . . 4-9, 6-4
Thomas, Donald B. . . . P4-3, P4-2*
Thomas, Jason . . . 9-11*
Tidwell, Jason . . . 6-11, P2-12
Tolleson, Doug . . . 6-4
Tomberlin, Jeffery . . . 7-13, 7-6, 6-2, 7-2, 7-4, 7-3, 3-1, 6-5, 6-9, 7-5, 6-1
Torres-Acosta, Reyna . . . P3-1
Traver, Brenna E. . . . 2-9
Trevelline, Brian . . . 2-9
Treviño-Cueto, Diego . . . P1-3*
Tuggle, Jenna . . . P4-20
Turner, Justin . . . P2-3*
Vafaie, Erfan . . . 9-10*, 5-1*
Varela, Kristyne . . . P2-4*
Vargo, Edward . . . 3-14, 4-1, 2-7*
Verble, Robin . . . P4-17*, 3-3
Villanueva, Raul T. . . . P4-7, P4-19
Villar, Gabriel . . . 3-5
Villegas-Luján, Renato . . . P4-18, P3-1*
Vyavhare, Suhas . . . P4-5*, 9-1*
Walker, Hannah . . . P2-1*
Walker, Nathan R. . . . P2-5
Wayadande, Astri . . . P4-12*
Weaver, Scott . . . 10-7
Webb, Joel . . . 9-7*
Wenzel, John . . . 2-9
Whisenant, Torie . . . P2-8*
White, Jennifer A. . . . 3-7
Wiernasz, Diane . . . 2-5*
Wilson, Greg . . . 4-8, 11-6*
Wilson, Rylee . . . P2-5*
Wright, Geraldine A. . . . 2-10
Wright, Robert . . . P2-9*
Wulff, Jason . . . 3-7
Yang, Fengchun . . . 7-13*
Young, Mac . . . P1-2
Ysquierdo, Cherity . . . P4-3*
Zarrabi, Ali . . . P4-20, P3-6, P4-1*, 3-16
Zepeda, Ramon . . . 1-7*

* presenting

Common Name Index

American burying beetle 3-4, 4-5, 4-6, P3-7
angoumois grain moth P4-15
bagrada bug 11-10
bed bug P3-10
bird cherry-oat aphid 11-8, 3-11
black soldier fly 7-2, 7-3, 7-4, 7-5, 7-6
blacklegged tick P2-3
blackmargined aphid P4-11
boll weevil 3-6
bollworm P4-9
booklouse P3-9
carrion beetle 3-3
cattle tick P2-12
chilli thrips 8-1
common long-horned bee 3-13, P2-9
corn earworm P1-2, P4-18
cotton fleahopper 11-4, P4-5
crab spider P4-9
ear tick P2-1
eastern grape leafhopper P4-6
eastern subterranean termite 2-7, 3-14
fall armyworm P1-2, P4-18
flower thrips 4-4
golden winged skimmer P2-11
green lacewing 1-5
green sweat bee 3-13
greenhouse whitefly P3-1
hairy maggot blow fly 3-18
honey bee 1-3, 1-9, 2-9, 3-5, 2-10, 2-12, 3-10, 3-15, P2-2
honey-bellied agapostemon P2-7
horn fly 6-12, P2-10
house fly 1-7, 7-3, P4-3
Indian stingless bee P4-4
lesser grain borer 11-9
lesser mealworm 6-8
lone star tick P2-5
maize weevil P1-1
oleander aphid 1-8
onion thrips 4-4
potato psyllid P2-4, P4-7
red flour beetle 11-9
red imported fire ant 1-1, 1-8, 2-6, 3-1, 3-2, 6-2
relapsing fever tick 6-7
rice weevil 11-9
rusty grain beetle P4-8
sawtoothed grain beetle 6-3
screwworm 3-18
secondary screwworm 1-2, 3-18
small hive beetle P2-2
southern cattle tick 4-9, 6-4, 6-11, 6-13, P3-8
southern green stink bug P4-16
southern house mosquito P1-3, P2-6
spined assassin bug P3-5
spotted alfalfa aphid P4-20
spotted bird grasshopper 1-6
squash bee P3-3
stable fly 6-10
sugarcane aphid 3-7, 3-9, 4-7, 4-8, 11-6, 11-7, 3-16, P3-2, P3-6, P4-1, P4-9, P4-14, P4-19
tawny crazy ant 2-2, 2-6, 4-1
Texas agapostemon P2-7, P2-9
tomato mirid P4-7
western bean cutworm P4-18
western flower thrips 8-1
winter tick 6-9
yellowfever mosquito 6-1, 6-5, 6-6, P2-11, P4-12

Scientific Name Index

Acari Argasidae *Otobius megnini* P2-1

Acari Ixodidae *Amblyomma amblyomma mixtum* 3-8

Acari Ixodidae *Amblyomma amblyomma tenellum* . . . 3-8

Acari Ixodidae *Amblyomma americanum* P2-5

Acari Ixodidae *Boophilus annulatus* P2-12

Acari Ixodidae *Boophilus microplus* 6-13, P3-8

Acari Ixodidae *Dermacentor albipictus* 6-9

Acari Ixodidae *Ixodes scapularis* P2-3

Acari Ixodidae *Rhipicephalus microplus* 4-9, 6-4, 6-11

Araneae Thomisidae *Mecaphesa spp.* P4-9

Blattodea Rhinotermitidae *Reticulitermes flavipes* 2-7, 3-14

Coleoptera Bostrichidae *Rhyzopertha dominica* 11-9

Coleoptera Curculionidae *Anthonomus grandis* 3-6

Coleoptera Curculionidae *Sitophilus oryzae* 11-9

Coleoptera Curculionidae *Sitophilus zeamais* P1-1

Coleoptera Laemophloeidae *Cryptolestes ferrugineus* . P4-8

Coleoptera Nitidulidae *Aethina tumida* P2-2

Coleoptera Scarabaeidae 3-3

Coleoptera Silphidae 3-3

Coleoptera Silphidae *Nicrophorus americanus* 3-4, 4-5, 4-6, P3-7

Coleoptera Silphidae *Nicrophorus orbicollis* P3-7

Coleoptera Silvanidae *Oryzaephilus surinamensis* 6-3

Coleoptera Staphylinidae 3-3

Coleoptera Tenebrionidae *Alphitobius diaperinus* 6-8

Coleoptera Tenebrionidae *Eleodes carbonarius* P2-8

Coleoptera Tenebrionidae *Embaphion muricatum* P2-8

Coleoptera Tenebrionidae *Epitragosoma arenaria* P2-8

Coleoptera Tenebrionidae *Tribolium castaneum* 11-9

Diptera Culicidae *Aedes aegypti* P2-11

Diptera Calliphoridae *Chrysomya rufifacies* 3-18

Diptera Calliphoridae *Cochliomyia hominivorax* 3-18

Diptera Calliphoridae *Cochliomyia macellaria* 1-2, 3-18

Diptera Chloropidae *Cryptonvevra nigritarsis* P4-2

Diptera Culicidae *Aedes aegypti* 6-1

Diptera Culicidae *Aedes aegypti* 6-5, 6-6, P4-12

Diptera Culicidae *Culex quinquefasciatus* P1-3, P2-6

Diptera Muscidae *Haematobia irritans* 6-12, P2-10

Diptera Muscidae *Musca domestica* 1-7, 7-3, P4-3

Diptera Muscidae *Stomoxys calcitrans* 6-10

Diptera Stratiomyidae 7-13

Diptera Stratiomyidae *Hermetia illucens* 7-2, 7-3, 7-4, 7-5, 7-6

Hemiptera Aleyrodidae *Trialeurodes vaporariorum* . . . P3-1

Hemiptera Aphididae *Aphis nerii* 1-8

Hemiptera Aphididae *Melanaphis sacchari* 3-7, 3-9, 4-7, 4-8, 11-6, 11-7, 3-16, P3-2, P3-6, P4-1, P4-9, P4-14, P4-19

Hemiptera Aphididae *Monellia caryella* P4-11

Hemiptera Aphididae *Rhopalosiphum padi* 11-8, 3-11

Hemiptera Aphididae *Therioaphis trifolii forma maculata* P4-20

Hemiptera Cicadellidae 11-2

Hemiptera Cicadellidae *Erythroneura comes* P4-6

Hemiptera Cimicidae *Cimex lectularius* P3-10

Hemiptera Miridae *Nesidiocoris tenuis* P4-7

Hemiptera Miridae *Pseudatomoscelis seriatus* 11-4, P4-5

Hemiptera Pentatomidae *Bagrada hilaris* 11-10

Hemiptera Pentatomidae *Nezara viridula* P4-16

Hemiptera Reduviidae *Sinea* P3-5

Hemiptera Reduviidae *Sinea diadema* P3-5

Hemiptera Reduviidae *Sinea rileyi* P3-5

Hemiptera Reduviidae *Triatoma* P3-4

Hemiptera Triozidae *Bactericera cockerelli* P2-4, P4-7

Hymenoptera Apidae *Apis mellifera* 1-3, 1-9, 2-9, 3-5, 2-10, 2-12, 3-10, 3-15, P2-2

Hymenoptera Apidae *Melissodes communis* 3-13, P2-9

Hymenoptera Apidae *Peponapis pruinosa* P3-3

Hymenoptera Apidae *Trigona iridipennis* P4-4

Hymenoptera Braconidae *Aphidius colemani* 3-11

Hymenoptera Braconidae *Diaeretiella rapae* 11-3

Hymenoptera Braconidae *Lysephlebus testaceipes* . . . 11-3, 11-8

Hymenoptera Formicidae *Nylanderia fulva* 2-2, 2-6, 4-1

Hymenoptera Formicidae *Solenopsis invicta* 1-1, 1-8, 2-6, 3-1, 3-2, 6-2

Hymenoptera Halictidae *Agapostemon angelicus* P2-7

Hymenoptera Halictidae *Agapostemon melliventris* . . P2-7

Hymenoptera Halictidae *Agapostemon texanus* 3-13, P2-7, P2-9

Hymenoptera Halictidae *Lasioglossum* 3-13, P2-9

Hymenoptera Trichogrammatidae *Trichogramma pretiosum* P4-15
Hypocreales Clavicipitaceae *Aschersonia aleyrodis* . . . P3-1
Ixodida Argasidae *Ornithodoros turicata* 6-7
Lepidoptera Gelechiidae *Sitotroga cerealella* P4-15
Lepidoptera Noctuidae *Helicoverpa zea* P1-2, P4-9, P4-18
Lepidoptera Noctuidae *Spodoptera frugiperda* P1-2, P4-18
Lepidoptera Noctuidae *Striacosta albicosta* P4-18
Neuroptera Chrysopidae *Chrysoperla carnea* 11-3
Neuroptera Chrysopidae *Chrysoperla rufilabris* 1-5
Odonata Aeshnidae P2-11
Odonata Libellulidae *Libellula auripennis* P2-11
Orthoptera Acrididae *Schistocerca lineata* 1-6
Primates Hominidae *Homo sapiens* P4-13
Psocoptera Liposcelididae *Liposcelis corrodens* P3-9
Psocoptera Liposcelididae *Liposcelis paeta* P3-9
Rhabditida Heterorhabditidae *Heterorhabditis sp.* P1-3
Thysanoptera Thripidae *Frankliniella occidentalis* 8-1
Thysanoptera Thripidae *Frankliniella tritici* 4-4
Thysanoptera Thripidae *Scirtothrips dorsalis* 8-1
Thysanoptera Thripidae *Thrips tabaci* 4-4

Wyndham Garden Hotel Austin

FLOOR PLAN