2019 GMCA Meeting

First Session

1. Annie Thompson – AMCA Washington Day Update
    a. Key topics
        i. SMASH Act – funding for local mosquito control
        ii. REDTAPE Act – reduce duplicative permitting from EPA
        iii. Reform of Endangered Species Act
    b. Current mosquito update given to legislators
2. Mickey Taylor – Pesticide Update
    a. Online study guides – call or email Mickey for link
        i. 3 courses for core manual
        ii. 1 course for mosquito control manual
    b. UGA Safety Education Program - https://extension.uga.edu/programs-services/pesticide-safety-education.html
    c. Currently has CAT 24 and CAT 41 Study Guides online
    d. Online study guides can replace the paper manuals
    e. Good continuing education information
    f. Pollinator protection information
3. Bobby Moulis- WNV in Chatham County, 2019
    a. Long history with mosquito-borne diseases
    b. CCMC established in 1957
        i. Building out on barrier islands
        ii. Large salt marsh mosquito problem
    c. Early data collected with New Jersey light traps
        i. Henry Lewandowski switched program to CDC light traps
        ii. Started using gravid traps for WNV surveillance
    d. Truck trap
    e. Testing used to be through the CDC
        i. Results took months
        ii. Mosquito slurry was injected into mice
    f. 1980s – chicken sentinel program started
        i. Focus on EEE
        ii. Coops stationed behind someone's house in the rural areas
        iii. Added WNV testing, but results took too long
    g. WNV
        i. Started using UGA to test mosquitoes for virus when WNV was introduced
        ii. Early testing included birds and mosquitoes
        iii. Human data take too long to be reported
        iv. Horse positives are extremely limited
    h. Using the data
        i. Created a core area where WNV is found every year – hot spot
        ii. This has been added to over time
        iii. Use thresholds for determining when to spray
    i. Sentinel chicken program
        i. Birds are now elevated up into the canopy
        ii. Single birds in an exit trap cage – can collect the mosquitoes

iii. Primarily for EEE, but do occasionally get WNV seroconversion

j. What happened in 2019
   i. WNV started earlier
   ii. Huge jump in positives in July
   iii. Still getting a few positives
   iv. Most of the positives are from the hot zone

4. Christopher Slaton & Emily Evans – Mosquito Research at VSU: Heartworm Prevalence and Insecticide Resistance Studies
   a. *Dirofilaria immitis*
      i. Vector – a variety of different species
         1. Vectors vary by regions
         2. Competency varies by region
      ii. Current study
         1. List of all vectors in the South Georgia/North Florida region
         2. Compare species abundance and infection rates in urban vs rural areas
            a. 8 urban sites – Valdosta, GA
            b. 8 rural sites – Greenville, FL (Dixie Plantation)
      iii. Trap types – CDC and gravid
      iv. Testing done through gel electrophoresis
      v. Used only head and thorax – determine positive mosquitoes that could transmit the parasite
      vi. Results
         1. 15240 mosquitoes collected
            a. 29 species
            b. Pooled 944 for DNA extraction – 23 species
         2. Urban/rural sites were 81.5% dissimilar as far as abundance
   b. Permethrin Resistance in *Aedes albopictus*
      i. Mechanisms of resistance
         1. Behavioral
         2. Physical
         3. Physiological
      ii. Objectives of study
         1. Baseline data
         2. Presence of KDR resistance
      iii. Collection
         1. Black 9 oz cups
            a. Hay infusion
            b. Textured paper
         2. Wooden clothespin to secure paper
      iv. 16 locations in Valdosta
         1. 2 control sites
         2. 14 sites where pesticides are sprayed
      v. Bottle bioassay – test requires 100 mosquitoes
         1. 97-100% susceptible
         2. 90-96% possibility of resistance
         3. <90% resistance
      vi. Results
         1. Resistance seen – only 50% mortality seen at 10 minutes

        a. Currently working on PCR to detect KDR alleles
5. Jessi Howard Kenney – Lessons Learned from Advancement in Mosquito Control Operations
    a. IPM programs
    b. First line of defense
        i. Surveillance
        ii. Larviciding
    c. Baseline data
    d. Programs
        i. Hurricane response
        ii. WNV response
        iii. EEE response
        iv. Public education
            1. Community events
            2. Schools
6. Industry Spotlight
    a. AllPro Vector – Carlos Gonzales
    b. ServDay – Dr Zia Siddiqi & Ammol Duggal
        i. Integrated vector management software
        ii. Complete tool for managing a vector control program
            1. Scheduling
            2. Tracking people, equipment, pesticide
            3. Accounting
            4. Social media
            5. Data collection
        iii. Real-time geospatial data
            1. Spatial display
            2. Spatial analysis
        iv. Capture image and audio
        v. Lab data
            1. Disease
            2. Insecticide resistance
        vi. Cloud-based
        vii. External data integration
    c. Target Specialty Products – Steve Molnar
7. Andrew Ruiz – Recent Assessment of Tick Activities in Environmental Health Programs in the US
    a. NACCHO assessment - https://essentialelements.naccho.org/archives/tag/tick
    b. 2004-2016: ticks accounted for 76.5% of vector-borne diseases
        i. Ranges are expanding
        ii. New TBDs are showing up
    c. Assessment
        i. 9 states
            1. 8 local programs
            2. 1 tribal program
        ii. Both low and high capacity areas
        iii. Pre-interview questionnaire
        iv. Phone interview
        v. Questions
            1. Level of involvement

2. Best practices/resources
3. Unmet technical needs

vi. Results
1. 8 of 9 programs doing some tick activities
2. 5 programs reported ticks were a priority
3. 7 reported receiving no funding
4. Community education was the most common tick-related activity reported

vii. Surveillance
1. Passive
a. Human attached tick study
b. Animal attached tick study
2. Flagging
3. Identification

viii. Challenges
1. Funding and staffing
2. Routine tick surveillance
3. Access to human case information
4. Training

ix. Successes
1. Even some information is better than nothing
2. Internal and external partnerships help
3. Community engagement is important for understanding priorities

8. Ray King – LaCrosse Virus in the Appalachians: A State Park Case Example
a. Focus of LAC at the border of Georgia, TN, and North Carolina
b. 2 unreported cases of LAC in state park near Chatsworth, GA
i. One was an out-of-State visitor
ii. One was a child of a park employee
c. Strategy Meeting
i. Public Health
ii. City of Chatsworth
iii. State Park
d. Plan
i. Surveillance
ii. Educational posters
iii. Barrier spray
iv. Repellents
v. Larviciding
e. Area
i. Spring near campgrounds
ii. Creek fed by spring
iii. Flood plain
1. Trees grew in flood plain and died
2. Lots of tree holes
3. Holes filled in by state park personnel over winter
4. Area treated with larvicide
iv. Lots of chipmunks
v. Lots of *Aedes albopictus*, but they are likely not involved in transmission

f. No further human cases associated with park
g. *Ochlerotatus triseriatus*
    i. Populations fluctuate yearly
    ii. Infected females more effective at mating
    iii. Virus transferred vertically and venereally

9. Paul Efird – Mobile County Vector Services: A History of Prevention
    a. Some history
        i. Mobile was founded in 1702
        ii. 1704 – yellow fever outbreak
            1. Yearly yellow fever outbreaks
            2. Lots of 2-3 story houses
                a. Thought bad air caused diseases
                b. *Aedes aegypti* doesn't fly up very high
        iii. Mobile Board of Health established in 1816
        iv. Alabama gained statehood in 1819
        v. 1875 – Alabama Department of Public Health established; health departments established in all 65 counties
        vi. 1905 – last yellow fever outbreak
    b. Current operations
        i. 13 inspectors
            1. 3 rodent control
            2. 10 mosquito control
                a. Complaints
                b. Larviciding
                c. Hand fogging
                d. Truck fogging
                e. CDC traps
                f. Sentinel chickens
        ii. 1 mechanic
        iii. 9 night spray truck drivers
    c. Map
        i. Bordered by rivers and swamps
        ii. Mobile Bay
        iii. Port city – multiple dredge sites
    d. Mosquito species
        i. Aedes
            1. Albos are found everywhere
            2. Sollicitans are found all along the coast
            3. Taeniorhynchus are found in the southern part of the county
            4. Atlanticus, vexans, japonicus
        ii. Culex
            1. Coronator
            2. Quincs
            3. Nigripalpus and Salinarius
        iii. Perturbans mostly south of the city
        iv. Anopheles – 3 species
        v. Psorophora
            1. Columbiae

2. Ferox

e. Disease testing through the university

Second Session

1. Rosmarie Kelly – The History of *Aedes aegypti* in Georgia
2. Joe Conlon – Malaria: History's Killer
    a. Many historical figures have died of malaria over history
        i. Malaria was found in temperate as well as tropical areas
        ii. History has been altered due to malaria
    b. The Vatican was moved to its present location due to malaria
    c. Many US presidents suffered from recurring bouts of malaria
    d. Malaria was no respecter of status, wealth, or career
    e. Malaria has been an important issue in war
        i. Napoleon used malaria as a biological weapon
        ii. During the Revolutionary War, quinine was one of the big expenditures for the troops
        iii. Disease, including malaria, killed and incapacitated more soldiers that battle
    f. CDC developed due to malaria
    g. The mosquito has killed more people than any other cause in history
    h. Malaria has become a tropical disease due to:
        i. Standard of living in temperate areas
        ii. Public Health
        iii. Mosquito control
3. Cameron Gundry - Molecular Diagnostics Vector Program
    a. Co-Diagnostic Inc
        i. Real-time PCR multiplex test kit
        ii. Mission-based company
        iii. Human and environmental testing
            1. Arboviruses
            2. Malaria
    b. PCR
        i. Exponential duplication as opposed to linear
        ii. Generates billions of DNA or RNA copies
        iii. Detector is fluorescent
        iv. Process has been extremely streamlined from the original process
    c. Process
        i. Capture mosquitoes
        ii. Extract DNA or RNA
        iii. Run PCR
    d. Available test types
        i. RAMP test – immunological technique
        ii. VectorTest – immunological technique
        iii. PCR test
            1. RNA or DNA
            2. Amenable to testing for multiple viruses at one time
        iv. Sequencing techniques
4. Annie Thompson - Education and Outreach in Mosquito Control

a. Education is part of IPM – http://www.gamosquito.org/resources/papers/AMCA_BMP.pdf
b. Education
    i. Training personnel
        1. Start with entry into program
        2. Annual standardized training to keep up with current info
            a. Diverse topics
            b. Refreshers
        3. Professional meetings
        4. Resources for Pest Control Professionals
    ii. Public education
        1. Write curriculum targeting Georgia Teaching Standards
        2. County events
        3. Health fairs
        4. Goal: communicate a message of personal protection and mosquito prevention
    iii. Requested outreach
        1. Asked to provide information
        2. Usually grows from an interaction with a member of the public
    iv. Social media – proceed with caution
        1. Website – ecphd.com/environmental-health/mosquito.html
        2. Exterior links
        3. DPH Facebook
c. Why do this?
    i. Recruit support
    ii. Promote partnerships
    iii. Promote funding
    iv. Reduces misconceptions
    v. Increases reported issues
    vi. Shows community support
    vii. Builds reputation

5. Industry Spotlight
    a. Central Life Sciences – Kelly Deutsch
        i. Altosid Duplex granule – methoprene core with Bti shell
        ii. Altosid P35 – spherical pellets
        iii. Strike midge control
    b. Clarke Mosquito Control – Joe Strickhouser
        i. Maris 3.0 – natural unsynergized pyrethrum
        ii. Equipment and product
        iii. Joe is retiring – new rep will be Sydney
6. Tiffany Nguyen – Insecticide Resistance Testing in Georgia
    a. What is pesticide resistance?
        i. Product no longer works well or at all
        ii. Comes about because the product is used too often or incorrectly
    b. How to determine resistance – Bottle Bioassay (https://www.cdc.gov/parasites/education_training/lab/bottlebioassay.html)
        i. Collect eggs
        ii. Rear mosquito to adult stage

iii. Expose mosquitoes to known pesticides
iv. See if mosquitoes die

c. Our process
    i. Got funding
    ii. Set up lab in Richmond County
    iii. Focused on high risk areas
    iv. Prelim data
        1. Southern counties, 2018
            a. *Aedes albopictus* – susceptible to permethrin
            b. *Culex quinquefasciatus* – varied levels of resistance to permethrin
        2. 2019 data
            a. Varied levels of resistance to permethrin in both species
            b. Quincs were susceptible to malathion
            c. Preliminary data show resistance to permethrin and deltamethrin
            d. *Aedes albopictus* showed higher mortality with the synergistic added, and were susceptible to bifenthrin
    v. *We need help*
        1. Help us collect eggs
            a. Plastic shoe boxes painted black
            b. Unbleached paper towels
            c. Water or hay infusion – depends on species
            d. Binder clips to hold paper towels
        2. Aedes
            a. Leave trays overnight
            b. Keep towels moist for 3 days
            c. Store in a dry spot until they can be hatched
        3. Culex
            a. Leave trays out overnight
            b. Collect eggs in a small container (urine cup)
            c. Hatch

d. Lessons learned
    i. No larvicide in hay infusion
    ii. Clean jugs to transport hay infusion
    iii. Keep eggs moist in order to allow them to embryonate
    iv. It can be hard to get supplies

e. Sharing the results
    i. Share, not blame
    ii. Focus on cost efficacy
    iii. Provide data
    iv. Talk about IPM

f. Malathion
    i. Cost
    ii. Cleaning equipment
    iii. Acceptability

Third Session

1. Savannah Duke – Alabama Report: Current Status in the Vector World
    a. Centralized –
        i. 2 semiautonomous counties
        ii. No centralized mosquito control
    b. 67 counties – 66 health departments
    c. Just broke a very long drought
    d. AlabamaPublicHealth.gov/infectiousdiseases
    e. Mosquito surveillance at ID&O
        i. Conduct mosquito and MBD surveillance
        ii. Map the presence of albos and aegypti
            1. *Aedes aegypti* found in Mobile in 2017
            2. *Ochlerotatus japonicus* is also spreading in Alabama
        iii. Pesticide resistance
        iv. Courtesy yard inspections by environmentalists – started with ZIKV
    f. Egg collections
        i. Used for surveillance
        ii. Plan to start insecticide resistance studies
    g. Tick surveillance begins winter of 2019
    h. Plan to start in-house testing using RAMP test
2. Laura Peaty – Trapping Mosquitoes: The Good, The Bad, and The Ugly
    a. A lot of information can be determined by trapping
    b. Influences
        i. Weather
        ii. Collection time
        iii. Choice of trap
        iv. Seasonality
        v. Choice of bait
    c. Types of traps used
        i. New Jersey light traps
        ii. Truck traps – used in the 1960s
        iii. Bait traps – used hamsters and chicks
        iv. Chicken sentinels and exit traps
            1. Established in 1981
            2. Switched to individual birds in 1992
            3. Added exit trap in 2005
        v. CDC light trap
        vi. Gravid trap – started use in 2001
            1. First WNV+ mosquito pool in 2001
            2. Also use to collect Culex eggs
        vii. BGS trap
            1. Lures
                a. Octenol
                b. BG lure
            2. Started using this in 2014
    d. Smart trap technology
        i. Remote sensing device for BGS trap
            1. Received August 2019
            2. Counts small, mosquitoes, and large

3. Issues
    a. Battery died - starting using 500-amp car battery
    b. Getting the mosquitoes out was a problem
    c. Had to reset the lure location in trap
    d. Over estimated number of mosquitoes by quite a bit
    e. GPS coordinates were not always accurate
ii. Could the counter be used with a CDC light trap?
    1. Had to be temporary so devises could be put back to usual use
    2. Still had issues with power and counts
        a. Used 3 batteries
            i. Light
            ii. Fan
            iii. Counter
        b. Put counter above motor
        c. Saw an improvement in accuracy

e. Lessons learned
    i. Battery power needs to be increased
    ii. Collection cup needs modification
f. Future goals
    i. Try gravid trap
    ii. Use CO2 cylinder
    iii. Traps that actually ID mosquitoes by wingbeat frequency or saliva

3. Eva Buckner – CDC Bottle Bioassay Results Show Need for Rotating Organophosphate and Pyrethroid-Based Adulticides against Florida *Aedes aegypti* and *Culex quinquefasciatus*
    a. Domestic mosquitoes
        i. Aedes aegypti
        ii. Aedes albopictus
        iii. *Culex quinquefasciatus*
    b. Domestic mosquito control
        i. Education
        ii. Source reduction
        iii. Larvicide
        iv. Adulticides
    c. Factors influencing resistance
        i. Mosquito control products
        ii. Other sources of pesticides associated with urban environments
    d. Parker et al, 2019 JOVE, Distribution of Florida Domestic Mosquitoes
    e. Current project
        i. Continue Parker et al work
        ii. Determine distribution of *Culex quinquefasciatus*
        iii. Resistance testing
        iv. Map distribution and insecticide susceptibility maps
    f. Results
        i. Study has been ongoing for ~1.3 years
        ii. Insecticide susceptibility maps
            1. Susceptible >95% mortality
            2. Developing resistance 90-95% mortality
            3. Resistance <90% mortality

g. Using resistance testing results to make management recommendations
    i. Report with results for all AI tested
    ii. Management recommendations based on results
h. FMEL.IFAS.UFL.EDU
    i. Reporting on insecticide Resistance in Georgia
    ii. Updated every 3 months
i. Journal of the Florida Mosquito Control Association has been reincarnated

4. Roxanne Connelly – CDC Hurricane Funding and Current Activities of the Arboviral Disease Branch, 2019
    a. https://www.cdc.gov/ncezid/dvbd/index.html
        i. Branches are based on pathogen
            1. Mosquito
            2. Ticks
        ii. Several funding mechanisms
            1. Broad agency agreements – special circumstances
            2. ELC – annual funding
                a. 2019 – new 5-year cycle
                b. Ticks and mosquitoes are now combined
                c. Funding usually depends on disease du jour
            3. Regional Centers of Excellence – funded for 5 years
                a. Applied research
                b. Responsive training
                c. Community of practice (collaboration/communication)
            4. Hurricane funding
                a. Cycle
                    i. Started in 2018
                    ii. Hurricanes were in 2017
                    iii. Ends September/December 2020
                b. Varied uses for funding
                c. Internal use of money
                    i. Resistance testing kits
                    ii. On-line taxonomic key
                    iii. Evaluation of novel interventions – Wolbachia-infected male mosquitoes
                    iv. JAMCA – mosquito control response to natural disasters
        iii. 2019 – big EEE outbreak in NE over to Michigan
        iv. Future projects
            1. Update WNV guidelines
            2. Meet with European CDC
            3. Intervention evaluations – does aerial spraying reduce human cases
5. Chris Lesser – AMCA National Update (Www.mosquito.org)
    a. Current issues
        i. Federal funding
        ii. NPDES – can no longer support this fight
        iii. SMASH Act – passed the House and Senate, waiting on Appropriations
        iv. Organic farms – regulatory language
        v. EPA round table discussion on malathion
        vi. Endangered Species Act – AMCA continues to be involved

vii. National Wildlife Refuges – like butting your head against a wall
viii. Pesticide registration and re-registration

b. Current business manager is Dave Butler from AMG
c. JAMCA is now open access format
d. Webinars are free to members
e. BMPs, 2017
f. Train the Trainer workshops
g. Free eLearning modules
h. AMCA Research Fund
i. Young Professionals group – created in 2010
j. Washington Conference, May12-13, 2020
k. Next annual meeting, March 16-20, 2020 in Portland, Oregon

6. Industry Update
    a. Co-Diagnostics – Sean Egin
    b. AMVAC - Peter Connelly
7. Dan Suiter – Household Pests
    a. Training Center
        i. Started as a termite training center
        ii. Added components for other pests
            1. Bed bugs
            2. Commercial IPM (cockroaches)
            3. 10-week certificate program
            4. School IPM
            5. Home IPM
        iii. 67 unique credit hours per year
        iv. Strong GDA interaction
    b. Webinar program
        i. Monthly
        ii. Live
        iii. 24 CEUs per year for Structural Pest Control industry
        iv. CAT 41 CEUs (1-800-ASK-UGA1)
            1. Go to County Extension Agents office
            2. Pay fee
            3. Watch archived webinar
            4. Fill out paperwork for 1 CEU
    c. Key pests in Georgia – invasive species
        i. Asian needle ant
            1. First found in Decatur
            2. Native to Asia
            3. Found under yard debris
        ii. Tawny crazy ant
            1. Found in 7 southern Georgia counties
            2. Honey dew farmers
            3. Found in leaf litter and under trash
            4. Tawny crazy ant eliminates fire 🐜
        iii. Formosan termites
            1. Native to China
            2. Very destructive

3. Came in through the ports
4. Being distributed through the movement of railroad cross ties
5. Identification
    a. Caramel color
    b. Swarms at night
    c. Attracted to light
    d. Starts swarming in May (native termites swarm in Feb)
    e. Produce large numbers of soldiers
    f. Tear drop shaped head

iv. Anobiine powderpost beetle
1. Cause damage to crawl space joists
2. Not much is known about them

v. Turkestan cockroach
1. Blattid
2. Males have wings
3. Strong odor

vi. Smokybrown cockroach

8. Lorenza Beati – Tick Training Update
    a. US National Tick Collection
        i. Collection is over 100 years old
        ii. Belongs to Smithsonian
        iii. Moved to GSU in 1990
            1. Jim Keirans – curator
            2. Jim Oliver – director of ISP
        iv. ~96% of the world's described tick species
        v. Large library on ticks and TBDs
        vi. Collection is curated
    b. Research
        i. Morphological
        ii. Ecological
        iii. Epidemiological
        iv. Molecular
    c. Education
        i. Field work
        ii. Service to public and tick researchers
        iii. Student studies
        iv. Outreach
    d. Training
        i. Taxonomy
        ii. Online resource – http://us-tick-key.klacto.net/
            1. Basic pictorial key
            2. Ticks of eastern US
        iii. Tick Workshop through SE Center of Excellence
            1. Started in 2018
            2. 2 weeks
            3. Variety of topics
        iv. One-to-one training available
        v. 2 fellowships available for thesis master's students

vi. Collaboration is vital

Fourth Session

1. Sophia Racey – Dirofilariasis: A Model for Onchocerciasis?
    a. Onchocerciasis – river blindness
        i. 2nd cause of infectious blindness worldwide
        ii. Cause terrible itching
        iii. Huge economic problem
        iv. Vectored by black fly
        v. Difficult to cure
    b. Onchocercidae
        i. *Dirofilaria immitis* and *Ochocerca volvulus* are in the same roundworm family
        ii. *Dog heartworm*
            1. Vectored by mosquitoes
            2. Mature in malpighian tubules
            3. Migrate to mouthparts
        iii. River blindness
            1. Vectored by black fly
            2. Mature in flight muscles
            3. Migrate to mouthparts
    c. Study
        i. Autogenous female flies from lab
        ii. Blood feeding container used to feed females on infected blood
        iii. Dissected to look for microfilaria to be sure they passed the ciberial armature (https://www.ncbi.nlm.nih.gov/pubmed/7949322)
        iv. Let others live to see if microfilaria would mature to L3
            1. Black flies died before microfilaria could have matured
            2. Tried different blood type to no avail
2. Dariana Rodriguez, Christopher Slaton, & Emily Evans – Early Season Abundance of *Culex restuans*
    a. Mosquito surveillance
        i. 14 trap sites
        ii. Lowndes County
        iii. Mosquitoes pooled for viral testing
        iv. Use both CDC and gravid traps
    b. *Culex restuans*
        i. 2 peaks of activity – spring and fall
        ii. Estivate during high temperature periods
    c. Study
        i. Is there an association between increase in restuans and number of WNV pools?
            1. Factor 1: how late do restuans persist in spring
            2. Factor 2: week when ration of restuans to quincs exceeded 1 (crossover)
            3. Factor 3: overall abundance
        ii. Looked at sites with a high risk of WNV activity
        iii. Statistical analysis
            1. Looked at the 3 factors and WNV MLE
            2. Correlation coefficients

a. Last week of persistence – no correlation
b. Crossover – no correlation
c. Overall abundance – moderate correlation

d. Results
    i. Regression line for abundance and MLE
    ii. Predicted an infection rate within what was actually found in 2019
    iii. There are other variables in play as regression line only explains ~46% of the data
e. Why?
    i. Restuans likely amplifies virus early in the year
    ii. Restuans overwinter as adults with minor activity
    iii. It is possible that WNV overwinters in restuans
    iv. Overwintering mechanism for WNV is not completely understood

3. Darold Batzer – Mosquito Populations in Carolina Bays
    a. What is a Carolina Bay?
        i. Depression wetland
        ii. Forested
        iii. Not sure where they come from
        iv. Vegetation and amount of water varies
    b. Mosquitoes in these bays – light traps
        i. *Culiseta* m*elanura*
        ii. A variety *of Culex spp*
        iii. *Cq perturbans*
        iv. *Anopheles crucians*
        v. Others
    c. EEE
        i. Overwintering mechanism is unknown
        ii. All the components for EEE transmission found in Carolina Bays
            1. Enzootic vector
            2. Birds
            3. Bridge vectors
        iii. Tested mosquitoes but got no virus isolations
    d. Some interesting discoveries
        i. *Cq perturbans* were not univoltine
        ii. May be bivoltine in Georgia
        iii. Possible bridge vectors
            1. Late season perturbans
            2. *Culex* spp
    e. Ecology of Carolina Bays
        i. Lots of mosquito predators found
        ii. Assumption – lots of predators would lead to few mosquitoes
            1. Some predators were better at controlling mosquitoes than others
            2. No negative correlations between mosquitoes and predators
                a. Mosquitoes appeared to adapt to living with the predators
                b. Probably enough vegetation to protect the mosquito larvae
                c. However, larval densities per sample were low
                d. Carolina Bays are typically large, so they still produce significant numbers of mosquitoes

e. Larval control would be large

4. Joe Iburg – Mosquito Control in the Desert and the Bullhead City Experience
    a. Bullhead City abatement program
        i. Black fly control program due to increase in black fly after dam was placed in the 70s
            1. Mostly nuisance species
            2. Rarely bite
        ii. Started having a mosquito problem
            1. Primary mosquito species
                a. *Ps columbiae*
                b. *Ae vexans*
                c. *Cx tarsalis*
            2. City wanted to increase soccer tourism
            3. Had huge brightly lit fields that were constantly irrigated
            4. Larvae found in pockets of water in heavily irrigated grass
            5. There is also a lot of flood irrigation in area being blown into town by strong south winds
                a. Became a political issue
                b. Fields are owned by many different groups including the Mojave Indians
                c. Use it or lose it system of water rights
                d. Lots of Bermuda grass grown for seed
            6. Control
                a. Larvicide
                    i. Altosid and Natular in sports fields
                    ii. Vectolex used in fields
                    iii. Larvicide applied via backpack spreader
                b. Aerial application of adulticide used after hatch
                    i. Fyfanon worked but wasn't allowed everywhere
                    ii. Naled wasn't accepted
                    iii. Duet worked fairly well
                    iv. Deltagard is water-based and just didn't work well in a desert environment
                c. Fogged sport fields
    b. Also had a caddisfly issue (https://www.britannica.com/animal/caddisfly)
        i. Nuisance issue
        ii. Similar behavior to the black fly
        iii. No products are labeled for caddisfly control
            1. Spraying adults is ineffective and hazardous to the environment
            2. Larvicides that kill caddisfly would kill everything else
            3. Contributing factors
                a. Davis Dam completion
                b. Black fly suppression
                c. Quagga mussel introduction – cleaned water
                d. Koi herpes virus – killed carp
                e. Willow beach fishery failure – fewer trout
                f. Diatom overgrowth
                g. Other

i. Bats
ii. Swallows
iii. Effluent
iv. Bed stabilization
v. Water temperature
vi. Climate
vii. Unknowns

iv. Possible fixes
1. Restock trout
a. Feed on caddisfly at all stages
b. Excess fish add excess nutrients
c. Endangered species issue
d. Invasive fish ate the trout
2. Trapping
3. Attractant pheromones to interrupt mating
4. Water quality research
5. Homeowner education

5. Doug Nelson – Good Housekeeping in Mosquito Control
a. Prevents
i. Injury
ii. Spills
iii. Fines
iv. Environmental issues
v. Death
b. Follow SOPs
c. Includes preventative maintenance
d. Requires
i. Proper PPE
ii. Spill kits
iii. Training and education
e. Things requiring good housekeeping
i. Chemical storage
1. Chemical rooms have sprinkler systems
2. Floors are beveled to prevent spills
ii. Chemical waste
iii. Spill kits at storm drains
iv. Facility is Category 3 storm rated
v. Hurricane plan in place
f. Underground fuel tanks
6. Mark Blackmore – Geographic Variation in Vector Prevalence and WNV Detection in Lowndes County
a. Locations
i. Different habitats at surveillance sites in Lowndes County
ii. Dixie Plantation in north Florida
b. Weekly data collection
i. 12-14 locations
ii. 2 trap types
1. CDC

2. Gravid
iii. Primarily urban/suburban
iv. Testing
1. Plaque assay
2. RT-PCR

c. Mosquitoes
i. 35 species found
ii. Viruses
1. EEE
2. LAC
3. WNV
4. Flanders and variant
5. Highlands J
6. Keystone
iii. Minimum infection rates vary between locations

d. Site characterization
i. Vegetation
ii. % wetlands
iii. Virus activity
1. # positive pools
2. How often the site is positive
iv. Mosquito species diversity – hot spots have lower species diversity

e. Some other studies
i. WNV exposure serosurvey
ii. Human behavior, as related to mosquito exposure, survey
iii. Avian population assessments
iv. Climate patterns and WNV

f. What is the true risk based on exposure and behavior?

Business Meeting

2019-2020 Board

1. President – Allan Hillman
2. VP – Laura Peaty
3. Members
    a. 1-year: Tiffany Nguyen
    b. 2-year: Doug Nelson
    c. 3-year: Annie Thompson\
4. Secretary/Treasurer – Karen Farris
5. Sustaining member – Jason Conrad (Univar)
6. Past president – Steve Pavlovich