GMCA Annual Meeting
Oct 14-16, 2016

Oct 15: Session 1

I. AMCA Washington Day - Rosmarie Kelly
II. Importance of Fabrication to a Mosquito Control Program - Douglas Nelson
    A. Starting a project
        1. Why - buy or build
        2. What - efficiency
        3. When - how soon is it needed
        4. Where - where will the product be used
    B. Some projects
        1. Chickens
            a) Restraining device for bleeding chickens
            b) Mobile chicken cages with predator proofing
            c) Mobile cage hanger
        2. Traps
            a) CDC light trap hanger
            b) Gravid traps
            c) Impinger traps for droplet testing
            d) Hanger for bottle rotator stand
            e) BG Sentinel trap covers
        3. Rearing cages
        4. Dual nozzle system for ULV truck spray rig
        5. Calibrated tiles for aerial spray testing
    C. Costs
        1. Labor
        2. Hard materials
III. *Mansonia tittillans* in Georgia - Robert Moulis
    A. New species introductions
        1. 1980s *Aedes albopictus*
        2. 2007 *Culex coronator*
    B. 2014
        1. *Mansonia tittillans* found late in the season
        2. Associated with water lettuce and water hyacinth
            a) Not commonly found in Savannah
            b) Haven't yet found what it is using
        3. Found at 4 sites
            a) One aspiration collection
            b) 3 CDC light trap sites
            c) Found at widely distanced sites north of Savannah
        4. 2015
            a) Found in 7 sites in Chatham County
            b) Found in 3 sites in Jasper County SC
            c) Had been found in Beaufort County SC before
            d) Low numbers overall but numbers are increasing
    C. Looks to be a natural introduction
    D. Species is known to be a nuisance species
    E. Species is a late season species (Aug and later)

F. Historic records
    1. Both *Mansonia* spp have been found in several counties in Georgia
    2. Not all records can be confirmed
G. Habitat
    1. Mixed hardwood
    2. Commonly found with *Culex nigripalpus*
    3. Seems to be using cattails

IV. Culicoides Biting Midges of the SE US - Stacy Vigil
A. Ceratopogonidae
    1. ~150 species in US
    2. ~1300 species world wide
    3. Not well described
        a) 31 sub genera
        b) 38 species groups
        c) 13% uncategorized
    4. Wide variety of habitats
        a) Mud
        b) Saltmarsh
        c) Wet sands
        d) Tree holes
        e) Decaying vegetation
    5. Medical importance
        a) Bite irritation (sweet itch)
        b) Transmit arboviruses, protozoa, and filariasis parasites
        c) Veterinary problem in the US
            (1) Orbivirus
                (a) Blue tongue (BTV)
                (b) EHDV
            (2) Endemic in the SE
            (3) Outbreaks and spreading is occurring in other parts of the world
B. Surveillance
    1. Mapping current distribution
    2. Method
        a) CDC traps
            (1) No CO2 used
            (2) Trap into ethanol collection jars
        b) Identification done by morphological characteristics
        c) Some have to be slide mounted
    3. Study has run from 2007
        a) 55 species found
            (1) All SE except FL - 34 species
            (2) FL - 32 species
            (3) Trap efficiency is 60%
        b) *Culocoides insignis* makes up 77% of species caught in FL
            (1) Known vector
            (2) No known transmission in US
        c) Range changes have been seen based on historic data
C. Some species
    1. *Culicoides sonorensis*

a) Associated with livestock
b) Range seems stable
c) Distribution is spotty
d) 3 sibling species
e) Primary vector of BTV in SE

2. *C. insignis*
a) Primarily found in South America
b) Range is changing
c) Vector of BTV in neotropics

V. Wing Beats Magazine - Stephen Sickerman
A. The cover story
1. Fall 1990 (Sunrise edition)
2. Current events in mosquito control
3. Looking for cover photos
B. The inside scoop
1. Price - free!
2. Industry support is vital
3. Magazine put out quarterly
C. Always looking for articles
1. 1500 to 2500 words
2. Not refereed
3. Pictures, graphs, charts accepted

VI. Industry Spotlight
A. AllPro - Joe Andrews
B. Bayer - Gordon Morrison
1. Deltagard (deltamethrin)
a) Type II pyrethroid
b) No synergist
c) Very low dose
2. Now available for wide area control
C. Central Life Sciences - Steve Sullivan

VII. Public Perception in a Post-Ferguson World - Florrie Kohn
A. Need to know your community
1. Mosquito control is a public service
2. Public perception does impact your job
3. Be aware of agendas
B. Public perception
1. Understanding what view the public has about issues
2. Swayed by media
3. Can be difficult to change a negative public perception
4. Dealing with public perception
a) Maintaining a positive public image
b) Be honest and open
c) People tend to lump groups
d) Social networking feeds into the viewpoints of society
e) Your behavior will have an impact on your industry
5. Ferguson, MO
a) Young people want things fixed today
b) Social media and cell phones spread viewpoints rapidly

(1) Anonymous contributors
(2) No accountability
(3) Rapid dissemination

6. Actions will be interpreted according to the viewers mindset and experiences
7. It is important to consider the perceptions and experiences of others

C. Communication is the key
1. Racial issues
2. Generational issues
3. Environmental issues
4. Economic disparities

D. Situations can rapidly become wide spread and out of control

E. Mosquito control in black neighborhoods
1. Enlist the neighborhood
2. Get messages to black organizations
3. Go to black churches
4. Have black spokespersons
5. Praise those in the community who do things correctly
6. Make your messages conversational, not an order
7. Remember, not everyone has internet access

F. Key points
1. Public perception changes quickly
2. Be prepared to deal with issues
3. Public perception can be wrong
4. Public perception is visual
5. Public perception is shaped by the media
6. Public perception is different for everyone
7. Problems exist - there are things that must be understood

VIII. Pesticide Safety through Label Interpretation - Mickey Taylor

A. EPA update
1. Proposed new certification and training rule
a) www2.epa.gov/pesticides-worker-safety/EPA-proposes-stronger-standards-people-applying-riskiest-pesticides
b) 3-year certification cycle
c) Will need CEUs in core and in category
2. Minimum age for RUPs will be 18

B. THE LABEL IS THE LAW
1. Pesticide names
a) Chemical name
b) Common name
c) Trade name
2. Signal words
a) Levels
(1) Danger-Poison (I): high toxicity
(2) Danger (I)
(a) High
(b) Eye and skin damage concerns
(3) Warning (II) - moderate
(4) Caution (III) - slight
b) Indicate the relative acute toxicity

3. Precautionary statements
    a) PPE
    b) Routes of contamination
    c) Specific action statements
    d) Statement of practical treatment
        (1) First aid
        (2) Antidotes
    e) Hazards
    f) Equipment needs
    g) Environmental hazards
4. Bee advisory box
    a) New from EPA
    b) Pollinator protection
5. Physical or chemical hazards
    a) Flammable
    b) Corrosive
6. Emergency contact info
    a) CHEMTREC
    b) Local poison control
    c) Local physicians

C. Deviations
1. Host or site must be on the label, but the pest does not have to be listed
2. Any application method not prohibited can be used
3. Pesticides can be applied at lower doses than specified on the label
4. Pesticides can be combined with other substances unless prohibited on the label

D. Public perception
1. Be professional
2. Communicate what and why
3. Stay current with current practices
4. Be prepared- educate
    a) Have copies of SDS and labels to hand out
    b) Do not ever lie or make things up
    c) Have application records available
    d) Be careful of your language

IX. Status Update on Investigations of Residential Mosquito Treatments - Tiffany Nguyen

A. On campus surveillance study
1. Trapping
    a) CDC light trap with CO2
    b) CDC light trap without CO2
    c) Gravity trap
    d) Insect sweep nets
    e) Vacuum sampling device
2. Site
    a) Courtyard with clogged drain - 2014
    b) UGA fixed drain - 2015
3. Weather patterns monitored

B. Efficacy studies - barrier sprays
1. Three on-campus sites
2. Cage studies

a) Different plants
b) Lab reared species from eggs collected at field sites

3. Residential studies

C. Shadowing pest control companies
1. Methods
a) 30 treatment houses
b) 23 control houses
c) 2 different pest control companies
d) Treatment was once a month
e) Sampling done twice a month
2. Results
a) Applicator makes a difference
b) Product makes a difference
c) There was a benefit to barrier spray, but a lot of houses in the area did not have a problem with mosquitoes

Oct 16: Session 2

I. Entomology in Georgia, a Personal Viewpoint - Ray Noblet
A. Started in radiation biology with pest species
B. Need for medical entomology expertise
1. End of Vietnam War
2. Malaria issues
C. Got into working on black flies at Clemson University
1. Asked to talk to veterinarians about black fly
2. Needed info on *Leucocytozoon smithi*
D. Moved to UGA
1. Brought lab to UGA
2. Got interested in Bti and black fly control in the 1980s
E. Need for tools beside chemical insecticides for vector control
1. Need for education
2. Need for lobbying to support entomology programs
F. Extension programs
1. Broad knowledge base in Georgia
2. Good support from administration at UGA
G. New tools, new ideas
1. Control
a) Agricultural pest control
b) Urban pest control
c) Vector control
d) Nuisance species control
2. Toxicology

II. Rethinking Repellents to Save 200,000 Lives Per Year - Hogan Bassey
A. Dose makes the poison
1. Repellents that are "safe" to use in developed countries may not be safe in undeveloped worlds
2. 3 million die annually from mosquito-borne and bacterial diseases
3. $400 billion lost GDP annually (cycle of poverty)
4. 250 million are disfigured due to lymphatic filariasis
B. Mosquito repellents aren't always available

C. Current controls
    1. Bed nets used for a variety of things besides their intended function
    2. Pesticides are not readily available
    3. Prophylaxis isn't available or doesn't work
    4. Need for an easy to use, easily available product
    5. Paths to transformation
        a) Science
        b) Economics
        c) Culture - adoptability
D. Liv Ful - http://www.livful.com/
    1. Encapsulated
        a) Water-based
        b) Incorporates an antiseptic
        c) Incorporates a hydrating moisturizer
        d) Slow evaporation
        e) Less absorption
    2. Comes as a wipe
        a) Sweat proof
        b) Easy to use
    3. Manufacturing creates local jobs
    4. Active ingredient
        a) Used DEET initially
        b) Switched to IR3535
            (1) Biopesticide
            (2) Long lasting efficacy
            (3) Safe for children as young as 2 months
            (4) Odorless
            (5) Safe for sensitive skin
            (6) Light lotion feel
    5. Product cost
        a) Wholesale distribution model
        b) Subsidized model with corporate sponsors
    6. Next stage - working on making everything biodegradable

III. R U Ready? - Scott Yackel
A. Need to be prepared
B. Preparing for the season
    1. Budget for products
    2. Repair equipment
    3. Calibration
    4. Hiring and training
C. Preparing for the unexpected
    1. Vehicle accidents / Chemical spills
        a) Training
        b) Equipment
    2. Non-target issues / Citizen complaints
        a) Educate the public
            (1) Go to the public
            (2) Provide them with information on why and how control is done
        b) Targets

(1) Bee Keeper Association
(2) Homeowners Association
(3) County Extension Programs
(4) Schools
(5) Community Organizations and Clubs

c) Notifications
(1) Annual
(2) Recurring

3. Be aware of significant community events

D. Paperwork, paperwork, paperwork
1. Document everything
a) Document notifications
b) Keep a treatment log and maps
c) Keep a treatment data sheet
d) Keep calibration sheets with serial numbers
2. You will be prepared when there is an issue

E. When there is an issue
1. State Investigation
a) Need documentation for every line of the label
b) Have a written procedure
2. State Inspection
a) Be sure everything is clean and in good repair
b) Make sure equipment and containers are labeled
c) Calibration records
3. The operation is responsible, but so is the applicator

IV. The Use of Larvicides to Suppress *Culex* spp Mosquitoes in Grant Park, Atlanta, GA - JR McMillan
A. Pilot study related to dissertation
1. WNV model system
2. Effects of Larvicides on transmission

B. Defining primary and secondary vectors
1. Blood feeding behavior
2. Vector competence
3. Abundance and distribution
4. Persistence of transmission

C. Ecological vs public health approach

D. WNV
1. Primary vector - *Culex pipiens* complex
2. Secondary vectors
a) Other *Culex* spp
b) *Aedes albopictus*
c) *Ochlerotatus japonicus*
d) Others??

E. Methods
1. Case basins where *Culex* spp are breeding
a) Focused on parks and neighborhood parks
b) Treatment and control sites
2. Applied Larvicides to catch basins
3. 3 dips per week to collect larvae, pupae, and eggs

4. Treated catch basins with Bti weekly
    a) 36 permanent and semi-permanent sites
    b) Also dumped out containers
5. July 16-Sept 9, 2011
    a) Weekly gravid traps
    b) Occasionally set light trap in catch basin

F. Mosquito data
1. 2014 data
    a) No treatment done
    b) Positive mosquitoes were found
2. 2015
    a) Treatment had a statistically positive effect on larvae and pupae
    b) Adult numbers were lower but female number change was not significant
        (1) Good breeding sit
        (2) Good resting site
    c) Community numbers were not statistically different for 2014 and 2015 and for treated and untreated sites

G. Still to do
1. Analyze bird data
2. Analyze virus data

H. Future direction
1. Are Larvicides alone effective?
2. How large is the population of Culex breeding above ground?
3. How about below ground populations?

V. Industry Spotlight
A. Valent BioSciences - Candace Royals
B. UNIVAR - Jason Conrad
C. B & G Chemical - Claude Thomas

VI. Variation in Mosquito Microclimate and Implications for Vector-Borne Disease Transmission - Courtney Murdock
A. Background
1. The distribution of vector-borne diseases can largely be explained by changes in ambient temperature
2. Mordecai et al, 2013, Ecology Letters - many parameters are associated with the mosquito and are affected by temperature in a non-linear way
3. Diurnal temp fluctuation will integrate with mean temperature to affect disease transmission - temperature variation is important
4. PLoS One 2014 - dengue transmission (http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0089783)
5. Heterogeneity in landscape affects microclimate

B. Objectives
1. Does mosquito microclimate vary
    a) Urban
        (1) Higher average temp
        (2) Lower relative humidity
    b) Suburban
    c) Rural
2. Does variation translate into variation in mosquito traits
3. Can local weather stations be used to predict microclimate

C. Study sites
    1. Locations
        a) 3 urban - lots of impervious surface
        b) 3 suburban
        c) 3 rural - greatest diversity in land use
    2. 30 x 30 m sites
    3. Methods
        a) Mason jars with data logger at bottom filled with 300 ml leaf infusion
        b) Cage over top
        c) Data logger in shade in area
    4. Data
        a) 2 replicates
            (1) June
            (2) Sept
        b) Adults - collected daily
            (1) Size
            (2) Rate of development
            (3) Number emerging
            (4) Per capita growth rate
        c) Hypothesis - urban mosquitoes will be smaller and fewer in number
    5. Results
        a) Microclimate does vary in different areas
            (1) Urban sites are hotter overall
            (2) Less difference in warm part of the season
            (3) Urban sites are less humid
        b) Mosquito traits
            (1) Larval survival was lower in urban areas
            (2) Development rates were faster in urban areas in the fall
    6. Conclusions - Land use appears to be a predictor for mosquito ecology
    7. Future research
        a) What impact, if any, is there on disease transmission
        b) How can microclimate be determined using available data

Session 3

I. Zooprophylaxis: Using Livestock as Trap Crops for Disease Vectors - Annie Rich
    A. System being studied - malaria
        1. Many people die every year
        2. Difficult to control due to economic conditions where transmission occurs
        3. Current effort for control
            a) Bed nets
            b) Prophylaxis
            c) Pesticide treatments
    B. Vector - *Anopheles* spp
    C. Zooprophylaxis
        1. Using livestock to draw vectors from human hosts
        2. Can be passive
            a) Put livestock outside community or home
            b) Dilutes number of bites on human hosts
        3. Active or pesticide method

a) Inoculate livestock
b) Kills mosquitoes when they feed on the livestock

4. Vector considerations
   a) Anthropophilic mosquitoes prefer to feed on humans, but will feed on livestock if humans are unavailable
   b) Zoophilic mosquitoes prefer to feed on livestock
5. Considerations
   a) How many anthropophilic mosquitoes are drawn out of the houses to feed on the livestock?
   b) Does adding livestock attract additional mosquitoes?

D. Research question - will product kill mosquitoes that feed on cattle?
   1. Product used to inoculate cattle - eprinomectin
      a) Long lasting
      b) Resistance seen to ivermectin
   2. Rearing *Anopheles quadrimaculatus*
   3. Procedure
      a) Rear mosquitoes on cattle blood
      b) Shave patches on cattle
      c) Inoculate cattle
      d) Feed mosquitoes on cattle
      e) Draw blood to check for product

E. References
   1. http://www.ncbi.nlm.nih.gov/pubmed/2519684
   2. http://www.malariajournal.com/content/14/1/313

II. The Next Frontier: Exploring the Function of Bacteria in the Mosquito Gut - Kerri Lynn Coon
   A. Insect-microbe associations are ubiquitous in nature
   B. Mosquito-microbe associations
      1. Mostly focus on vector competence
      2. Molecular Ecology (2014), Coon et al
         a) Mosquitoes guts contains a relatively simple bacterial community
         b) Determined by community in environment
         c) Why are bacteria present
            (1) Axenic larvae can be developed by:
               (a) Sterilizing surface of egg
               (b) Rearing in bacteria free water
            (2) Axenic larvae do not develop or molt
            (3) Any viable bacteria that can colonize the gut of larvae will "rescue" development of the larvae
      3. Do field reared mosquitoes how the same results?
         a) Bacterial communities very variable
         b) Very site specific
         c) Axenic mosquito larvae do not molt
         d) Rescue depends on successful colonization of the larval gut
   C. What mechanism underlies this mosquito bacteria interaction?
      1. 2 approaches
         a) Bacteria-centric
         b) Mosquito-centric
      2. Approach 1
         a) Used *E. coli* as the bacteria

b) Density threshold for colonizing mosquito
c) Bacteria abundance varies over time
d) Effect of bacteria mutation
(1) Growth-defective bacteria did not rescue development
(2) Colonization-defective bacteria did not colonize mosquito guts
(3) Rescue-defective bacteria can grow and colonize mosquitoes but did not rescue

3. Approach 2 - Do bacteria contribute to mosquito digestion?
a) Methods
(1) Characterize the expression and activity of key digestive enzymes in the presence/absence of bacteria
(2) Develop a defined (holidic) diet to screen for digestion of major nutrient classes
b) Considerations
(1) The guts of mosquito larvae are strongly alkaline
(2) The guts of axenic larvae have little to no enzymatic activity
(3) Bacteria are contributing to the high pH in the larval gut
c) Other organisms can be weak rescuers - yeast, Protozoa, etc

III. Mosquito-Borne Diseases in Georgia: Connecting our Past to the Future - Mark Blackmore
A. Mosquitoes in Georgia
1. 55 species
2. 12 genera
3. Recent introductions have occurred
B. Only a few are vectors of concern
C. Lessons
1. Diseases
a) Malaria
(1) Pathogen introduced
(2) Competent vector was present
b) Yellow Fever
(1) Vector introduced
(2) Pathogen introduced
2. Establishment is possible
a) Changing landscape
b) Demographic patterns
D. Historic perspective
1. Periods of interest
a) Pre-Colonial period
b) 1733-1940
2. Malaria
a) 2 species established in North America
(1) *Plasmodium falciparum* - West Africa
(2) *Plasmodium vivax* - Europe
b) Georgia colonization
(1) European and African coastal settlements
(a) Rice & indigo are labor-intensive crops
(b) Impoundments increase *Anopheles* habitat
(2) Susceptibility to malaria differed between Africans and Europeans
(3) Small farms and plantations brought malaria inland

(a) Deforestation increased *Anopheles* habitat
(b) Slave labor brought parasites into area

c) Civil War in Georgia
(1) Malaria well established
(2) Atlanta campaign
(a) High morbidity
(b) Relatively low mortality
i) Higher for Confederate troops
ii) Lack of quinine for treatment
iii) Local alternatives
(1) Dogwood
(2) Georgia bark (*Pinckneya pubens* - https://en.m.wikipedia.org/wiki/Pinckneya_pubens*)*
(3) Willows

d) 1865 - 1945
(1) Background disease
(2) Mostly affected low income families
(3) Economic costs
(4) Cycled between low periods and resurgences
(5) Data problems
(a) Under-reporting
i) Positive diagnoses not being reported
ii) 1939 - 40% cases not reported
(b) Over-reporting
i) Insurance didn't pay for syphilis or TB
ii) Did pay for malaria deaths
iii) Febrile illnesses often reported as malaria post-mortem
(6) Military camp cases
(7) Resurgence in 1934-1936
(8) Tennessee Valley Authority established
(9) USPHS station in Baker County documented malarious areas in Georgia
(10) MCWA (1942)
(a) Set up to protect shoulders
(b) Protect workers from returning vets who were ill
(c) Grew into the CDC
(d) Push to use DDT to eradicate mosquitoes

3. Yellow Fever
a) Epidemics in Savannah (percent population dying)
(1) 1820 (9%)
(2) 1854 (6%)
(3) 1858 (0.6%)
(4) 1876 (3%)
b) Mostly coastal and urban
c) Hit and spread rapidly then disappeared
d) Major Ely McClellan
(1) Analyzed 1876 epidemic
(2) Miasma or infection?
(3) Conclusions
(a) Most severe in ports

(b) Inland cities with outbreaks were located on major roads or rail lines
(c) Refugees carried disease inland
(d) Carried on ships - largest outbreaks associated with ships from Cuba
(4) Quarantine Station established on Blackbeard Island
e) What happened to yellow fever
(1) 1881 - Carlos Finlay established the connection between yellow fever and *Aedes aegypti*
(2) 1900 - Reed Commission demonstrated transmission
(3) 1905 - last outbreak in New Orleans
(4) 1936 - Max Theiler developed a vaccine
(5) Yellow fever disappeared from North America

E. What about today?
1. West Nile Virus
2. EEE
3. LAC

F. What about the future?
1. DEN
2. CHIK
a) Togoviridae
b) Originally an African virus
(1) 2 lineages
(2) Vector is *Ae aegypti*
c) Recently spread to the Caribbean
d) One variant is more likely to be spread by *Ae albopictus*

G. Bottom line
1. Need to be concerned
2. Vulnerability to a disease does not mean it will become a problem
a) *Aedes aegypti*
(1) Anthropophilic
(2) Bite indoors
(3) Container breeder
b) *Aedes albopictus*
(1) Abundant
(2) Not host specific
3. Reality
a) Disease transmission is complicated
(1) Weather conditions affect mosquitoes and transmission
(2) Cultural and economic factors
b) Need a better understanding of the ecology and behavior of mosquitoes

IV. Integrated Mosquito Management - Rosmarie Kelly

V. Arboviruses of Veterinary Importance - Koren Custer

A. Diseases
1. Spread rapidly with possibility of introduction into new areas
a) Foreign animal diseases
b) Transboundary animal diseases
2. Nationally or state reported diseases
a) Dependent on state industry and regulations
b) May be eradicated or at low transmission levels
c) Diseases cause economic and public health issues

d) International trade issues

B. Lists
1. State reportable diseases
2. National animal health reporting system
3. Organization for world animal health
a) 117 member countries
b) Early warning to reduce risk of disease spread

C. Vector-borne diseases
1. Vesicular stomatitis
a) Affects equines, cattle and swine
b) Resembles foot and mouth disease
c) Zoonotic - flu like syndrome in people
d) Vectors (transovarial transmission)
(1) Sand fly
(2) Black fly
(3) Culicoides
(4) Also mechanical vectors
2. WNV
3. Bluetongue and EHD
a) Related viruses
b) Bluetongue
(1) Affects sheep primarily
(2) Vector is Culicoides
c) Epizootic hemorrhagic disease
(1) Affects deer - kills them
(2) Usually doesn't kill cattle
4. Texas cattle fever (bovine babesiosis)
a) Tick vectored
b) Some mechanical transmission by of mites and biting flies
c) Some degree of zoonosis
d) Eradicated in the US in 1943 - permanent quarantine zone
5. Heartwater
a) *Ehrlichia ruminantium*
b) Vectored by *Amblyomma* ticks
c) Thought to be spread in the Caribbean by cattle egret
d) Causes damage to the heart

VI. Industry Spotlight
A. Chemical Containers - Rick Eufrasio
B. Clarke - Joe Strickhouser
C. Adapco - Trey English
D. AMVAC - Peter Connelly

VII. Richmond County Mosquito Surveillance Update - Matt Erickson
A. Sites -
1. 15 in county
2. Phinizy Swamp
B. Objectives
1. Describe species assemblages
2. Compare relative abundance
3. Track activity patters

C. Jan 2014 - Aug 2015
    1. 678 trap nights
    2. 30 species found
    3. Started virus testing - 1 WNV+
    4. Activity
        a) Range
            (1) Begins in April
            (2) Ends in Oct
        b) A few mosquitoes can be found every month of the year
        c) Appears to be temperature dependent
            (1) Average low >50F
            (2) Average high >90F
        d) Peaks
            (1) May-June
            (2) Sept-Oct
    5. Abundance
        a) Swamp has highest number of mosquitoes
        b) 4 of 5 highest sites are adjacent to the swamp
    6. Diversity
        a) Number of species
            (1) Minimum number of species - 7
            (2) Maximum number - 23
            (3) Average - 16.8
        b) Menhinick's index score - diversity index (http://www.colby.edu/biology/BI131/Lab/Lab09CalcBiodivers.pdf)
        c) Species evenness
            (1) Shannon's equitability - http://www.tiem.utk.edu/~gross/bioed/bealsmodules/shannonDI.html
            (2) High range of values
            (3) Excluding wetland data leads to more even distribution of species
        d) Landcover vs mosquito diversity
            (1) Good correlation except for 4 sites
            (2) Mosquito control may have an impact

Oct 16 - Session 4

I. Glynn County Update: Transitioning from an In-House Program - Steve Pavlovich
    A. County
        1. Established in 1777
        2. 585 sq miles
        3. 85000 population
        4. Economy includes tourism
    B. Program history
        1. Started in early 1970s
        2. 1978 - became an IMM program
            a) John Carter
            b) Olan Chancy
        3. 2002-2012: transitional period
        4. 2013 - decided to outsource
    C. Contract Program

1. Did a mosquito survey throughout the county
    a) Got the species that were expected
    b) Numbers coming off impoundment areas were unexpected in some cases
2. Used data to formulate a plan
3. Created a stand-alone operation
    a) Purchase new equipment
        (1) Trucks
        (2) Spray equipment
        (3) ATV
        (4) Traps
    b) Locate, establish, outfit new office
    c) Hire local staff
    d) Aerial base for fixed wing aircraft
    e) Chemical containment and mixing facility
    f) Training and licensing

D. The program was tailored to the special needs of the county
E. Personnel
    1. General Manager
    2. Chief Biologist
    3. Program Manager - Entomologist
    4. 4 Field Techs
    5. Drivers
    6. Secretary
F. IMM program
    1. Inspections
        a) GPS mapping of breeding sites
        b) Rain gauge stations
        c) New Jersey light traps
        d) Gravid & CDC light traps
        e) Ovitraps
        f) Landing rate sites
    2. Surveillance
        a) Nuisance
        b) Vector
            (1) Contract with University lab
            (2) Year round testing
    3. Larviciding
        a) Mosquito fish
        b) Biochemical control
    4. Aerial application
        a) Partnered with Dynamic Aviation
        b) Larviciding and adulticiding of impoundment areas
    5. Ground spraying
        a) Handheld thermal and ULV sprayers
        b) Truck mounted ULV
    6. Public education
        a) Residential inspections
        b) Pamphlets
        c) Presentations

d) PSAs

G. Data
1. Track number of service requests
2. Track rainfall
3. Track mosquito populations

H. Other efforts
1. Special events barrier spray
2. Resistance testing
a) Bottle bioassay testing
b) Field cage testing
c) Larvicide ditch testing
3. Droplet testing

I. Challenges - be prepared
1. Public
a) Educating anti-pesticide groups
b) Beekeepers
c) Organic gardeners
2. Political - who was really in charge of the program

II. My First Year as Operations Manager - Allen Hillman

A. Things learned
1. Fairness and honesty
a) You must be fair in your dealings
b) Don't start out with a bad reputation
c) Tell the truth and keep the respect of your crew
d) Remember, you are the boss and not a friend at work
2. Ask questions
a) If you don't know, ask
b) Be willing to assist and be willing to ask for help
3. Lead by example
a) Always be willing to do anything you ask your crew to do
b) Be professional
c) Be on time
d) Communicate clearly
e) Dress appropriately
f) Leaders need to be part of the team
4. Learning
a) This is a continual thing
b) Learning should always be positive
c) Learn things well so you can teach the next person
d) Remember the paperwork
e) Learning about the people you work with and the people you serve is also important
5. Tasks
a) There are things that must be checked every day
(1) Truck and equipment maintenance
(2) Daily paperwork
(3) Work assignments
b) It is important to keep up with these things to have the most productive day possible

c) Even with daily tasks, it is important to look ahead
d) Customer service is an important part of the job

6. It is all about the mosquitoes
   a) About 24 species in area
   b) Surveillance is important to the job
   c) Knowing the species leads to knowing their biology and habitats
   d) Knowing which species helps determine how best to deal with complaints
   e) If you have to deal with NPDES, then use it to your advantage

B. It is all about looking to the future and improving both yourself and your program

III. Public Works and Mosquito Control - Robert Seamans

A. Mosquito control is part of Streets & Parks

1. Program started in 1999
   a) Citizens wanted spray
   b) Lots of complaints
2. The process
   a) Met with Mayor and Council
   b) Met with City Manager
   c) Met with citizens
3. Bottom line
   a) Not a mosquito control program
   b) Public works program that does mosquito control as part of the other duties
4. In the beginning
   a) Sprayed when there were complaints
      (1) Started learning more about mosquito control
      (2) Had to meet the level of expectation of the citizens
   b) Became involved in GMCA
   c) Budget was, and is, an issue
      (1) Had personnel, but no one was specifically assigned to mosquito control
      (2) Had a sprayer
      (3) Had the drive to do the job
   d) Did the best job possible
   e) Sprayed by calendar
5. 2002 - growing the program
   a) Received $3000 budget
      (1) Had to move other money around
      (2) Learned to play the budget
   b) WNV was getting started in Georgia
   c) Came to GMCA meetings
   d) Resources
      (1) Truck
      (2) ULV machine
      (3) Personnel
6. Things you need to learn
   a) The boss needs to know what you know
   b) Educating the public is vital to the job
   c) You need to know what mosquitoes are out there
   d) It is important to have good contacts
   e) You do not have to be an expert, just know what the key points are
   f) It doesn't need to be complicated

(1) Something is better than nothing
(2) Baby steps will build a program

7. Work with those outside your own department or agency
   a) Get the GIS folks involved
   b) Do a trial run of your procedures
   c) Be involved
   d) Meet with the pesticide reps, they are a great resource
   e) Develop relationships with agencies that do oversight
8. Paperwork is important
   a) Build in cost and time saving components
   b) Start small and build
   c) Good relationships will help bring in technology

B. The program has evolved
   1. It started with nothing
   2. It is now a good program
      a) Personnel
      b) Truck
      c) Spray unit
      d) Mapping
      e) Spray zones
      f) Mosquito surveillance and ID
      g) Pesticides
   3. Complaint driven
   4. Developed protocols
   5. Continuing to build

C. Being prepared is the greatest asset

IV. Evaluation of the CDC Autocidal Gravid Trap in the Context of LACv Vectors - Monica Henry
   A. History and background
      1. LAC was historically found in the Midwest
      2. It has been shifting more towards the Appalachian region recently
      3. LAC
         a) Disease of children under the age of 16
         b) Peaks from June thought Nov
         c) Vectors
            (1) *Ochlerotatus triseriatus* is primary
            (2) *Aedes albopictus*
            (3) *Ochlerotatus japonicus*
         d) Maintained in small mammals
         e) Transovarial and venereal transmission occur
   B. Why the shift to western North Carolina
      1. Human encroachment into areas where mosquitoes are found
      2. Insufficient vector control
      3. Methods
         a) Trapping
            (1) Baited CDC light traps
            (2) BG sentinel traps
            (3) Nasci aspirator
         b) Autocidal Gravid ovitrap (AGO)
            (1) Set up

(a) Black bucket
(b) Hay infusion packet
(c) Sticky board
(2) Attracts Gravid females
(3) Easy to use and maintain
(4) Cost effective

4. Study
   a) Determine the effectiveness of AGO for LAC surveillance
      (1) Used several attractants
         (a) Hay infusion
         (b) Oak leaf infusion
      (2) 36 traps in field
      (3) Randomized block design
      (4) 3 replicates
      (5) Collected mosquitoes from week one to week five
   b) Data collected
      (1) Counted
      (2) Identified as to sex and species
      (3) Physiological status determined
      (4) PCR assays to help with identification
   c) Preliminary results
      (1) AGO trap was highly specific for target species
      (2) 88% were Gravid
      (3) Mean yield was 0.84 mosquitoes per trap per week
5. Future plans
   a) Large scale trials
   b) Can AGO act as a vector sink in LAC endemic areas?

V. A Meta-Evaluation (Phase 1) of a Mosquito-Borne Disease Program - Thomas Kollars
   A. Conceptually, a meta-analysis uses a statistical approach to combine the results from multiple studies in an effort to increase power (over individual studies), improve estimates of the size of the effect and/or to resolve uncertainty when reports disagree (*https://en.m.wikipedia.org/wiki/Meta-analysis*).
   B. Resource - *http://www.medicine.ox.ac.uk/bandolier/painres/download/whatis/meta-an.pdf*
   C. Basis for evaluation
      1. Based on Tech Bull FCMA 8:20-23, 2008 paper by Chatham County
      2. Personal interviews
      3. Examination of archival data
      4. Analyzed data
   D. Four phases to a meta-analysis (*http://omerad.msu.edu/ebm/Meta-analysis/Meta3.html*)
      1. Identification
      2. Selection
      3. Abstraction
      4. Analysis
   E. Phase one - Formative Evaluation
      1. Document internal validity of the program
      2. A comprehensive WNV program was in place in 2003
      3. A comprehensive review of the program was done in 2003
         a) Discontinued sentinel chicken program for WNV

    b) Used historic data to place traps
    c) Changed adulticiding applications
    d) Control based on vector numbers, not WNV status
  4. Statistical analysis between pre and post program change
    a) Is this program component useful
    b) Have changes improved the program
    c) What else needs to be changed
    d) Cost-benefit analysis
- F. The search for predictors
  1. What birds are involved?
  2. Socioeconomic factors
  3. Model indicates that ~54 positive pools leads to increased risk of human disease; however, the predictive value is not high
- G. Conclusions
  1. Feasibility
  2. Acceptability/Fidelity
  3. Process evaluation
  4. Qualitative evaluation
  5. Quantitative impact/outcome
- H. Future -
  1. Continue with meta-analysis
  2. Extrapolate to other programs in Georgia
- I. Resources
  1. *http://www.ccace.ed.ac.uk/research/software-resources/systematic-reviews-and-meta-analyses*
  2. *http://www.pitt.edu/~super7/19011-20001/19431.ppt*
  3. *http://www.stat-help.com/meta.pdf*

Board meeting

I. Board Members 2015-2016
- A. President - Jeff Heusel
- B. VP - Kenna Graham
- C. Members
  1. One year - Joey Bland
  2. Two year - Steve Pavlovich
  3. Three year - Allen Hillman
- D. Industry Rep - Trey English
- E. Past President - Alan Gaines
- F. Extension Rep - Elmer Gray
- G. Public Health Rep - Rosmarie Kelly

II. Sustaining members
- A. 10 members this year
- B. Funding from ADAPCO

III. Treasurers Report
- A. Net loss for this year
- B. Still have a healthy bank account

IV. 2016 Annual Meeting Oct 12-14