**The 34th Annual Meeting of the**
**Georgia Mosquito Control Association**
**October 19-21, 2011**

## Wednesday, October 19, 2011

1) AMCA Washington Day – Henry Lewandowski
   a) Well organized by AMCA
      i) Educate participants about approaching the representatives
      ii) Educate participants about the issues
   b) Purpose
      i) Educate ourselves concerning legislative issues
      ii) Speak to our elected representatives
   c) Legislative issues
      i) CWA/NPDES (EPA)
      ii) ELC funding for national disease surveillance
      iii) Endangered Species Act and mosquito control
      iv) Food Quality Protection Act appropriations
         (1) Funding for data collection
         (2) Registration and re-registration of pesticides
      v) Mosquito control on wildlife refuges (USFWA) – rumor has it everything that has been worked on for the last 10 years is going to be scrapped
   d) Need to know who the key people are for the various committees and sub-committees
   e) Will likely talk to staffers instead of representatives
      i) Can actually be a good thing
      ii) Staffers can be subject matter experts
   f) Making appointments is key
      i) Start early
      ii) Need good planning to get to the meetings on time
      iii) House side is separate from the Senate side
      iv) 3 House buildings
   g) What did we accomplish
      i) Two representatives voted against HR 872
         (1) Not a political decision
         (2) There was a lack of understanding of the subject
         (3) Both agreed to reconsider the issue if it can back to the House for another vote
      ii) Explained the importance of continuing funding for the ELC
   h) Follow-up is essential
   i) Summary
      i) There was a lack of factual info on the issues
      ii) Continued uncertainty about HR 872 in the Senate
2) Timely Tips for Dealing with Your Boss – Stanton Cope
   a) What is a boss? Amongst other things, the person in charge
      i) Attitude – good or bad

ii) Management skills
iii) Personality
iv) Big picture or small???
v) Decisive or indecisive??
vi) Bored or interested

b) Key points
   i) If it interests your boss, it should fascinate you
      (1) Bosses are busy and have a lot to remember
      (2) Get info and package it
         (a) Digestible
         (b) Useable
         (c) Helpful
      (3) May need to remind the boss
      (4) Listen but wait to react
         (a) 1st time - Listen and file away
         (b) 2nd time – "I am still looking into that"
         (c) 3rd time – better be ready
   ii) Learn the personality of your boss
      (1) Figure this out early on
      (2) What will the boss tolerate and for how long
      (3) What does the boss like
      (4) What does the boss not like
      (5) What will cause the shit to hit the fan
      (6) When do you have the boss' attention
      (7) ASK – a good boss will share
   iii) Keep the boss informed
      (1) Immediate knowledge
         (a) Some things can wait
         (b) Some things can not wait at all
      (2) Bottom Line Up Front (summarize)
      (3) News
         (a) Good
         (b) Bad
            (i) Make it timely
            (ii) Plan
      (4) Pick your method of communication
         (a) Personal
         (b) Written record
      (5) 10% "belly up"
         (a) Bad things will happen
         (b) Be ready
   iv) Timeliness of info exchange
      (1) Don't put your boss on the spot
      (2) Tell only those who need to be told
         (a) Don't conduct business in the hallway
         (b) Don't talk in front of others who don't need to know
      (3) NO SURPRISES

(4) There are good times and bad times to pass on information
(5) Some bosses remember nothing
(6) Put critical info/decisions in writing

v) Consistency
(1) Be consistent on all issues
(2) Do not cry wolf
(a) Not everything is a crisis
(b) Not everything needs to be done right now
(c) Leads to a loss of credibility
(d) Try to remain calm
(3) Prioritize
(4) Tell your boss if a decision is needed and when

vi) Three white eggs
(1) Listen carefully
(a) What is being asked
(b) Ask for clarification if needed
(2) Don't think you know what is really needed
(3) Provide what is asked for the first time
(4) Deliver it in a timely manner
(5) Do not cry over broken eggs
(a) Even if you give the boss exactly what is asked for, it may not be accepted
(b) Sometimes things change
(c) Just move on

c) There are different ways to get to a good relationship with your boss
i) Keep trying
ii) It will make your life easier
iii) The path goes both ways

3) Industry Spotlight
a) UNIVAR
i) Julie Fogg and Dan Gibbous
ii) Full vector control product distributor
iii) Also provide control for other pests

b) Gregory Pest Control
i) Phil Hall – area regional manager
ii) Full service pest control
iii) 5 state area of coverage
iv) Bed bugs - canine scent detection dogs

c) AllPro Vector Group
i) David Sykes
ii) Premier formulators
(1) In the process of developing some new granular products
(2) Should be introduced by Spring 2012
iii) Packagers of products
iv) Temophos
(1) Granular and liquid
(2) Good for mosquito control in tires

v) Several other products available

4) The Effects of Permethrin Barrier Treatments on Non-target Arthropods – Ryan Bare
   a) Work in progress
   b) The introduction of WNV created a need for home-based mosquito control
   c) More jobs for pest management professionals
      i) Larvicides
      ii) Habitat assessment
      iii) Automatic misting systems
      iv) Barrier treatments
   d) Barrier treatments effective against
      i) Mosquitoes
      ii) Biting midges
      iii) Sand flies
   e) Growing public concern
      i) Desire for a "green" approach
      ii) Could using insecticides be more harmful than the diseases they are attempting to control?
      iii) Investigations
         (1) Honey bees (Hester et al 2001)
         (2) Crickets (Tietze et al 1996)
         (3) Aquatic insects
   f) Study purpose
      i) Ecological study showed no decrease in diversity after ULV application (Davis & Peterson)
      ii) Study replicates this ecological study using barrier spray
      iii) Bifenthrin
   g) Questions
      i) Effects of bifenthrin on non-target arthropods
      ii) Immediate and long-term effects
      iii) Some isolated species studies
         (1) Lady bugs in an enclosure
         (2) Sprayed vegetation then put in a know number of lady bugs
   h) Site
      i) Lowndes County Georgia
      ii) 20 x 20 meter test plots
      iii) 2 sets of 4 sites each
      iv) Habitat different in each area
      v) Corners marked with flags
      vi) 10 meters apart
      vii) Data collection
         (1) Pit fall traps at corners
         (2) $CO_2$ light trap in center
         (3) Sweep nets used once a week
   i) Dilutions and site treated were double-blinded
      i) Recommended label rate or water
      ii) Treated 3 times

iii) Sampling occurred 3 times after each treatment at 7 day intervals

j) Results
   i) Diversity index – measure the local members of a set consisting of various types of objects
      (1) The higher the number, the lower the diversity
      (2) Group trends
         (a) A lost diversity over time
         (b) B showing a similar trend but not as pronounced
   ii) Richness
      (1) The number of species present in an ecosystem
      (2) Decreases in both groups
   iii) Evenness
      (1) Relative abundance or proportion of individuals among the species
      (2) Shows changes in community structure
   iv) Formulas for these can be found at http://www.countrysideinfo.co.uk/simpsons.htm

5) The Flea Fauna of Georgia (USA) – Lance Durden
   a) Siphonaptera
   b) Feed primarily on mammals or birds
   c) Importance
      i) Some fleas are vectors
      ii) Zoonotic pathogens
         *(1) Rickettsia typhi* – murine typhus
         *(2) R felis* - flea-borne spotted fever
         *(3) R prowazekii* – found in flying squirrels
         (4) *Bartonella quintana* – cat scratch fever
      iii) Intermediate hosts of rodent and canine tapeworms
      iv) Nuisance biters
      v) Flea bite dermatitis – allergic reaction
   d) Pathogen transmission or ecological importance for fleas parasitizing wild animals is largely unknown
   e) Data
      i) Numerous flea surveys done in GA
      ii) Studies associated with typhus
      iii) Currently flea trapping is occurring
      iv) There is an endemic flea in GA
         (1) Collected once in 1954
         (2) Found in north GA at Brasstown Bald at >4700'
         (3) Collected on a northern short-tail shrew
         (4) *Nearctopsylla georgiana* Pratt & Harrison 1954
      v) Entomology class collections
      vi) Many other varied sources
   f) Results
      i) 26 species recorded
      ii) Families
         (1) Pulicidae – 8 species
         (2) Rhopalopsyllidae – 1 species

(3) Ctenophthalmidae – 7 species
(4) Ceratophyllidae – 5 species
(5) Leptopsyllidae – 4 species
(6) Ischnopsyllidae – 1 species

iii) 6 new species records for Georgia
iv) Some are very species specific
v) One species (western rabbit flea) was brought in on rabbits trapped in the southwest and released
vi) Very few bird fleas in Georgia

g) Cat fleas are extremely common in Georgia
h) Oriental rat flea
i) Pre-1958: very wide spread
ii) Post-1958: one sample found
iii) Probably less common than originally but more common than current records indicate
i) Rat fleas in general seem to have declined, but no one is actually collecting from rats currently
j) Conclusions
i) At least 25 flea species are native to Georgia
ii) 5 new species were recorded
iii) Rat fleas appear to be rare
(1) Abundant until the 1940s
(2) Murine typhus control may have reduced the numbers of these fleas
iv) Cat, squirrel, and rabbit fleas are common and wide-spread
v) Dog fleas are common in some localities
vi) *Pulex* spp primarily occur on carnivores
vii) Some fleas are more common in either north or south GA
viii) The chicken (sticktight) flea will actually feed on almost anything
ix) The Rickettsia and Bartonella pathogens have all been found in GA
k) Paper in press

6) Assessing the role of long lived reptiles in the ecology of EEE virus – Bill Irby
a) Reptiles are important as a blood source for mosquitoes
b) EEE cycle
i) Enzootic vector – *Culiseta melanura*
ii) Host - birds
iii) Epizootic vector – a variety of species
c) There are a lot of unanswered questions
i) Overwintering??
ii) Bridge vectors
d) Background
i) Mosquitoes do feed on both birds and reptiles
ii) *Culex erraticus* has some characteristics that make it of interest
(1) Feed equally on a wide variety of hosts
(2) Abundant
(3) Found at the right time to be involved in EEE transmission
e) Study
i) Gopher tortoise holes implicated as an overwintering site for *Culex erraticus*

ii) Sampled mosquitoes from the burrow
(1) A variety of different species
(2) *Culex erraticus* were the most abundant mosquito species
(a) Overwintering site
(b) Some were feeding on the turtles
(3) Fungus gnats were also extremely abundant

f) Second study at Ft Stewart in 2000-2002 looked at EEE and other parasites of gopher tortoises
i) Blood samples
(1) Blood-borne parasites
(2) Viruses
(3) Ectoparasites
(4) Intestinal parasites
ii) Results – parasite load
(1) Gopher tortoise tick
(2) Nematode in the family Trichostrongylidae
(3) Healthier turtles had lower parasite loads
(4) No EEE found
iii) Tortoise appears not to be implicated in EEE transmission

g) Study done by Cupp et al pointed at the water moccasin as a blood source for *Culex erraticus*
i) 2010 -2011: collected mosquitoes at EEE horse case sites
ii) Looked for snakes to sample – a bit scary
iii) Sampling and testing continues

7) The story of Clara Maas – Stanton Cope
a) Background
i) Yellow fever was endemic in Georgia at one time
(1) Major outbreaks still occur in other parts of the world
(2) Primary vector – *Aedes aegypti*

b) Water moats were used to keep ants off the beds of yellow fever patients
i) This provided great sites for *Ae aegypti* to lay eggs
ii) Kept the virus circulating in the area

c) History
i) Hypothesis that insect bites could transmit disease
ii) Dr Carlos Juan Finlay – yellow fever and mosquitoes
iii) Patrick Mason
(1) Found *Wuchereria masonia* in mosquitoes
(2) Thought the worm fell into water and was ingested
iv) Sir David Bruce – animal African trypanosomiasis
v) Sir Ronald Ross – malaria parasites in Anopheles
vi) Walter Reed
(1) The Etiology of Yellow Fever, 1900
(2) Yellow fever virus was spread only by mosquito bites
(3) http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2329228/
(4) Used human volunteers
vii)This study led to controlling of mosquitoes in Cuba

d) Success….then tragedy

i) Second series of experiments was done in Cuba
ii) Dr Juan Guiteras didn't feel that mosquito control was enough
iii) Immunized people against yellow fever by allowing mosquitoes to feed on a patient with mild yellow fever then allowing them to feed on naïve people
iv) 19 volunteers – 3 died

e) Clara Maass – an American Heroine
i) Born 28 June 1876
ii) East Orange, NJ
iii) Left school at age 15
iv) Nursing school – Newark German Hospital
(1) Graduated in 1895
(2) 1898 – head nurse (age 21)
v) Served as a contract nurse for Army (Spanish-American War)– discharged in Feb 1899
(1) Jacksonville, FL
(2) Savannah, GA
(3) Santiago, Cuba
vi) Nov 1899 – served in the Philippines
vii) Returned to Cuba in 1900
(1) Served in Dr Guiteras' experiment
(a) 19 participants
(b) Only woman and only American
(c) Received numerous bites in June, July, and Aug
(d) Last bitten 14 Aug 1901
(e) Became ill on 18 Aug
(f) Died 24 Aug at the age of 25
(2) Article on her death carried in many newspapers
(3) New York Journal, 26 Aug 1901
(4) All human experimentation was stopped

f) Honoring Clara Maass
i) Postage stamps
(1) Cuba – 1951
(2) US – 1976
ii) Her mother was given Clara's pension
iii) Hospital where she was head nurse was renamed the Clara Maass General Hospital

**Thursday, October 20, 2011 (Morning Session)**

1) Georgia Invasive Species – Ray Noblet
a) Not a new issue
b) Has become more serious recently
c) Invasive mosquito species traveled with people
i) *Aedes aegypti* – early European explorers
ii) *Culex coronator* – 2006
iii) *Ochlerotatus japonicus* – 2003
iv) *Aedes albopictus* – found in all Georgia counties by 1993

d) Why are these important
    i) Potential for nuisance issues
    ii) Drive out other species that may be less of a problem
    iii) Vector potential
    iv) May be harder to control than native species
    v) May need different trapping methods to determine population numbers
e) Other invasive species in GA
    i) Insects
        *(1)* Kudzu bug - *Megacoptera cribaria*
            (a) First identified in GA in 2009
            (b) Huge populations
            (c) Soybean pest – this is going to be big problem
            (d) Related to stink bugs – very odiferous
            (e) Gather in large numbers on buildings looking for overwintering sites
            (f) Serious urban pest
        (2) Brown marmorated stinkbug
            (a) Another agricultural pest
            (b) Only been found in a couple of places in GA to date
        (3) Soybean aphid
            (a) Been in US awhile
            (b) Recently found in Georgia
    ii) Cogongrass
        (1) Perennial grass
        (2) Grows up to 6' tall
        (3) Silky silvery flowers and seeds
        (4) Very aggressive invader
        (5) Spreads by rhizomes
        (6) Forest Service will come and treat to remove this at no cost
        (7) Primarily found in south GA with a concentration in SW Georgia
    iii) Herps
        (1) Burmese python
            (a) Established in most of Florida
            (b) Changing the ecology of areas where it is found
        (2) Northern African python
            (a) Aggressive
            (b) Established in south Florida
        (3) Black and white tegu
            (a) All over Florida
            (b) Fast growing, long lived lizard
        (4) Nile monitor lizard
            (a) All over Fl
            (b) Egg predator

2) What Lurks in Yonder Forest (or swamp)? Why do we care? - Danny Mead
    a) WNV and other arbovirus
        i) Highest year before 2011 – 126 WNV+ mosquito pools
        ii) This year – 396 WNV+ mosquito pools and counting
        iii) June

(1) Flanders was all we were seeing initially
(2) Then we got WNV, about a month early
(3) Lots of Culex quinquefasciatus

iv) Starting in July
(1) Lots of virus
(2) It never stopped
(3) We are still getting a few positive pools even with cooler temperatures

b) Why do we keep looking
i) WNV has been found in GA since 2001
ii) We pick up a number of other viruses as well
iii) Importance of looking
(1) Detect changes in transmission patterns of known viruses
(2) Important for mosquito control decision making
(3) Detect new or introduced viruses of public health or agriculture importance
(a) Dengue – >42 imported cases in GA
(b) Chikungunya – 2 imported cases
(4) Detect un-described viruses
(a) WellFleet Bay virus
(b) Durham virus
(c) Culex specific Flavivirus
(5) Detect changes in virus populations
(a) What is a virus?
(i) Virus is a piece of RNA or DNA surrounded by a protein coat
(ii) Replicate inside a cell
(iii) Can be very simple or more complex
(b) How do viruses change?
(i) Mutation
1. Example – Chikungunya was transmitted by *Aedes aegypti*
2. Single genomic mutation allowed for a new mosquito vector to become involved
3. Huge outbreak occurred with *Aedes albopictus* as the vector
(ii) Recombination
1. WEE and HJV are thought to be a recombination of EEE and a Sinbis-like virus
2. Creates new viruses
(iii) Reassortment
1. Happens with flu viruses
2. Occurs in viruses with segmented genomes
3. Happens in Orbiviruses
a. Cause hemorrhagic diseases
b. Transmitted by Culicoides
c. A whole new Orbivirus has been detected
d. Came about by reassortment

3) NPDES Mid-Range Program – Fred Koehle
a) Surveillance is the backbone of an IMM program
i) Visually check for areas that hold water

ii) Look for breeding sites
b) Larvicide early
i) Had larvicide in the drains before the rain came
ii) One less thing to worry about at the start of the season
c) Mosquito population levels
i) Landing counts
ii) Trapping
iii) Public complaints
iv) History
d) Educational component for peridomestic mosquitoes
i) Programs
ii) Handouts
e) Mapping used for monitoring
i) Use the Augusta-Richmond County Real Estate Property search
ii) GIS map with aerial overlay
iii) Match sites with complaints
iv) Use tools to measure area and distance on the map
v) Determine what tools are available for mosquito control
(1) Can you spray?
(a) Need to be outside of 300' from a body of water
(b) Drift buffer
(2) May just be able to larvicide
f) Action thresholds
i) Larval dips – one per dip
ii) Complaints
iii) Landing counts – 5 per minute
iv) Traps – 10 mosquitoes in the trap
g) Source reduction
i) Surveillance checklist
(1) Remove egg laying sites
(2) Complaint driven site inspections
ii) Maintain contact with county agency responsible for ditches and impoundments
iii) Maintain familiarity with health nuisance abatement policy
h) Chemical control
i) The label is the law
ii) Surveillance-based
iii) Target species must be active
(1) Each tech handles about 4 complaints a night
(2) 4 days a week
iv) Collect wind speed and direction data
v) No longer run spray routes
vi) Machines must be calibrated
i) Record keeping
i) Of vital importance to running an efficient program
ii) Needed for NPDES
4) Albert Freeman Africanus King, MD Scientist/ Iconoclast - Joe Conlon

a) Father of Integrated Mosquito Management
b) Published in a paper 15 years before Ronald Ross that mosquitoes transmitted malaria
c) Who was he?
    i) Born in England on January 18, 1841
    ii) Columbian College of Medicine -1861
    iii) Very educated man
    iv) Lived in Washington DC
    v) Cared for Confederate wounded at Bull Run and Union soldiers in Washington
d) What is he know for?
    i) Second physician on scene when Lincoln was shot
    ii) Wrote A Manual of Obstetrics in 1886 – used up until the 1930s
    iii) Noted lecturer
e) Why do we care about him?
    i) John Crawford had published earlier about insects and their possible involvement in disease transmission
    ii) Published a paper in 1882 about mosquitoes and malaria
        (1) Popular Science Monthly
        (2) Insects and Disease-Mosquitoes and Malaria
    iii) King's method of malaria control was to encircle the city with a wire screen as high as the Washington Monument
    iv) Germ theory had just been accepted in the 1880s
    v) 19 postulates for why malaria is not caused by a miasma
        (1) Malaria found in wet areas, mosquitoes are the same
        (2) Temperatures for development are the same for mosquitoes and malaria
        (3) Affinity for dense foliage
        (4) Both found in higher abundance in tropical areas
        (5) Atmospheric currents transmit both
        (6) Controlling mosquitoes controls malaria
        (7) Creating mosquito breeding sites leads to malaria
        (8) Malaria is most dangerous at the same time that mosquitoes are active, at night
        (9) Exposure occurs while sleeping outside at night
        (10) Malarial diseases occur when mosquitoes are most numerous
        (11) Anything that keeps mosquitoes out prevents malaria
    vi) Malaria prevention
        (1) IMM-based
        (2) Personal protection
            (a) Physical barriers
            (b) Repellents
        (3) Domiciliary protection
            (a) Exterior barriers
            (b) Interior "pesticides"
        (4) Municipal protection
            (a) Source reduction
            (b) Planting of forests

(c) Use of exterior lights
(5) A man of ideas – did not test his theories
(a) Used inductive logic
(b) Published a treatment of malaria using UV light
(c) Thought that dark-skinned people were protected from malaria because mosquitoes couldn't see them in the dark
(6) Had some crazy ideas – was quite a character
(7) Quote "What product of man's art has not been anticipated by nature?"
(8) Died in 1914

5) Industry Spotlight
a) Clarke Mosquito
i) Joe Strickhouser
ii) Full service mosquito control
iii) Contract with Fulton County – Erica Wyatt
b) Bayer Scientific
i) Don Bodkin
ii) Scourge
(1) Voluntarily withdrawn the dropping of the product
(2) Will continue to provide this product
iii) Distribute through ADAPCO
iv) Have been all adulticide
v) 2012 – fast Bti
c) Central Life Sciences
i) Charlie Pate
ii) Some changes
(1) XR Briquettes will be white –
(a) Silica based
(b) Packaging changes to reduce breakage
(2) Zenivex –
(a) Adulticide
(b) Working on crop tolerance label change
(3) Rebate program expansion

6) Urban Eco-Epidemiology of West Nile Virus in Atlanta Georgia – Rebecca Levine
a) Where is it found
i) WNV is endemic in the US
ii) Urban disease in eastern and mid-western US
iii) More rural in the western US
b) Not all urban areas with intensive insect and animal infection see corresponding human disease
c) Chicago
i) Illinois 2002-2010
(1) 1652 human cases
(2) Some risk factors determined
ii) Atlanta
(1) Far fewer cases
(2) Need to figure out why
iii) Study

(1) Does the high percent of tree cover and / or height of canopy constrain the WNV epidemic?
(2) Does the high diversity of avian species in Atlanta contribute to a WNV dilution effect?
(a) Diversity = disease dilution
(b) Length of time species are present

iv) Sites
(1) Zoo Atlanta
(2) Old Growth Forests
(a) Fernbank Forest
(b) Wesley Woods Preserve
(3) Parks
(a) Grant Park
(b) Piedmont Park

v) Why were these sites chosen?
(1) Human traffic
(2) Water features
(3) Open fields
(4) Wooded areas
(5) CSOs in vicinity

vi) Sampling
(1) What is sampled
(a) Birds
(i) Counts
(ii) Species
(iii) Blood samples
(b) Mosquitoes
(c) Zoo animals
(2) Use of fine-resolution imagery

vii) Results – 2010
(1) Avian
(a) 141 birds
(b) 13 species
(c) 48 out of 141 samples were WNV+ (34%)
(i) Higher than in Chicago
(ii) Primarily cardinals that were positive
(2) Mosquitoes
(a) 21784 female mosquitoes caught
(b) Primarily *Culex* – these are targeted
(c) Testing
(i) 49 WNV+ Culex
(ii) 0 WNV+ Aedes
(d) Blood meal analysis also done
(e) 2 week lag time in infection between mosquitoes and birds
(3) Habitat type
(a) Seropositivity in birds is higher in disturbed sites
(b) This is not found in mosquitoes

(4) What about the zoo?
(a) 2000 – WNV+ birds found from blood samples
(b) This was prior to WNV being "found" in Georgia
(c) This bird was probably infected in the fall of 1999

d) Conclusions
i) Importance of various bird species
ii) Transmission peaks in August
iii) Differences in transmission rates by habitat in birds but not mosquitoes
iv) WNV was likely here in 1999

e) Lots still to be done

7) La Crosse Encephalitis in Eastern Tennessee – Abelardo Moncayo

a) Serious disease
i) Most important pediatric encephalitis in the US
ii) Case fatality rate < 1%
iii) Lots of cognitive and behavioral issues associated with infection
iv) Most cases in children under 16 years of age

b) Transmission cycle
i) Host – small mammals
ii) Vector – *Ochlerotatus triseriatus*

c) High number of cases in east TN

d) Emergence in TN
i) From 1964-1996, only 9 cases reported
ii) 1997 – cluster of 10 cases
iii) Cases continued to increase
iv) Currently see 15-20 cases a year

e) Vectors of primary concern
*i) Oc triseriatus*
*ii) Ae albopictus*
*iii) Oc japonicus*

f) Hypothesis
i) Differences in mosquito abundances at case sites
ii) Differences in infection rates at case sites
iii) Differences in blood meal composition at case sites

g) Looked at trapping protocols

h) Study sites
i) Case reports were obtained from 2004-2009
ii) Cases were mapped and clusters were identified
iii) Calls were made to households
iv) Enrolled 6 households representing 5 cases

i) Methods
i) Ovicup collections
(1) Collected eggs in ovicup
(2) Reared larvae
(3) Collect and identify adults
ii) Larval collections
iii) Adult collections
(1) BG Sentinel traps

(2) Aspirators – Prokopac

j) Testing
   i) Cell culture
   ii) RT-PCR (looked for 24 different viruses)

k) Results
   i) Ovicups collected the most mosquitoes but it is very labor intensive
   ii) Larval collections contained all species of interest
   *iii) Oc triseriatus*
      (1) Best results from ovicups
      (2) These were positive eggs
      (3) Infected reared adults collected from June through August
      (4) Hard to determine how many infected females this represents
   *iv) Oc japonicus*
      (1) Probably first record of LACv-infection
      (2) Earlier in season
   *v) Ae albopictus* – a number were found positive

l) Conclusions
   i) Trap-dependent abundances seen
   ii) More work needs to be done

**Thursday, October 20, 2011 (Afternoon Session)**

1) WNV Transmission in CSOs – Recent Findings and Future – Gonzalo Vazquez-Prokopec
   a) http://www.envs.emory.edu/faculty/prokopec.html
   b) This work will be published next year
2) Black Fly Control and Whooping Cranes – Elmer Gray
   a) Whooping crane are a critically endangered species
      i) Tallest flying bird in NA
      ii) Wingspan of 7-8 feet
      iii) Weight is 14-17 lbs
      iv) Omnivorous
      v) Young birds are cinnamon color; adults are white
      vi) Affected by hunting and habitat loss and conversion
   b) Whooping Crane Eastern Partnership
      i) Established in 1999
      ii) US FWS
      iii) International Crane Foundation
      iv) Others
      v) Purpose – to build Eastern populations
   c) Operation Migration
   d) Reintroduction Project
      i) Started in 2001
      ii) First year survival was acceptable
      iii) Nest desertion became a problem
         (1) Nesting began in 2005
         (2) 2005-2010: no successful first time nests

(3) Patterns of desertion were evident
(4) Urbanek et al – 17 nests studied
(5) Dates of desertion was related to degree days above freezing
(6) Predation and water level were ruled out as reasons
(7) Could it be black fly?
(a) Thousands of black fly can be found at nest site on eggs
(b) Many are found feeding on adult crane fly

iv) Black Fly
(1) Small blood-feeding flies
(2) Larvae develop in running water
(3) Pupate near larval sites

v) Surveillance & control
(1) Conducted on refuge in 2009
(2) Sampled around refuge in 2010; pilot larviciding application conducted
(a) Issues with application of pesticides on refuges
(b) Larviciding has caused a big outcry even with treatment not being done on the refuge
(3) Suppression program initiated and evaluated in 2011

vi) Initial focus
(1) Bird feeding black fly *Simulium annulus*
(a) Adult flies emerge in spring
(b) Eggs laid in spring but remain dormant until fall
(c) Pupate in spring
(d) Flight range is about 6 miles
(2) Found in Yellow River near refuge
(a) Flows in 2011 were at record highs
(b) Had been at record lows in 2010

vii) Goal 2011
(1) Evaluate effect of eliminating 95% of black fly
(2) Treatment
(a) Water temp was 1-2 degrees C
(b) Flow rates were high
(c) Bti was used for treatment
(d) Treatment protocol
(i) Treat
(ii) Collect at various distances from treatment site
(iii) Bring to the lab
(iv) Check for mortality

viii) Results 2011
(1) Got about 85% suppression of black fly populations
(2) Saw an increase in nesting success in the area
(3) Project will continue in 2012

3) Industry Spotlight
a) Southern Helicopter Leasing - Cliff McGowan
b) ADAPCO – Trey English

4) Horsefly and Deerfly - Ian Brown
a) Genera

i) Chrysops - 83
ii) Tabanus - 107
iii) Hybomitra – 55 species

b) Implicated in mechanical transmission of various diseases
c) Biological transmission
*i) Trypanosomes*
*ii) Loa loa*
d) Bites cause stress in livestock and wild animals
e) People
i) Tourism and recreation
ii) Agriculture
f) Life cycle
i) Eggs laid on vegetation over water
(1) Laid in clusters of 100-1000
(2) Prefer a vertical substrate
(3) Hatch in 2-14 days
(4) Originally white but turn dark in several hours
ii) Hatch and drop into muck at water's edge
(1) Spindle-shaped larvae, pointed at ends
(2) Blade-like mandibles
(3) Rings of prolegs behind head
(4) Can be up to 2.5" in length
(5) Develop in either an aquatic habitat or in moist soil
(a) Deer fly – always aquatic
(b) Horse fly vary – just need a moist habitat
(6) Respiratory siphon
(7) 4-9 larval instars
iii) Pupate in dry soil near water's edge – overwintering state
(1) Pupal aster at one end
(2) Prominent eye and wing buds
(3) Spines on posterior abdominal segments
iv) Emergence in late spring
(1) Behavior
(a) Find a sugar meal
(b) Mate
(c) Take a blood meal
(2) Lifespan – up to 60 days
(3) Cutting-sponging mouthparts
(4) Can feed for 3-4 minutes
g) Some tabanids of importance in Georgia
i) Yellow fly – *Diachlorus ferrugatus*
(1) Peak season is April through June
(2) Eggs hatch in 5-12 days
(3) Prefer shade
(4) Anautogenous – must have a blood meal to develop eggs
(5) Fierce biters
(6) Peak activity is late afternoon, esp when it is overcast

(7) Will enter houses to bite
ii) Saltmarsh greenhead fly – *Tabanus nigrovittatus*
(1) Found from April- Sept with a peak in July
(2) Facultatively autogenous – can lay a batch of eggs before having a blood meal
(3) Prefer to fly through gaps in vegetation
(4) Fierce biters

h) General behavior
i) Long range cue is $CO_2$
ii) Short range cues
(1) Motion
(2) Size
(3) Shape
(4) Dark colors
iii) Almost all are daytime feeders
iv) Host range
(1) Deer fly –
(a) Many different types of animals
(b) Prefer moving targets
(2) Horse fly – large stationary mammals
v) Males
(1) Feed on nectar
(2) Territorial
(3) Hover to attract females

i) Trapping
i) Traps work by exploiting the behaviors of the target insect
ii) No universal fly trap
iii) Black sphere trap
(1) Good for deer and stable flies (Muscidae)
(2) Dark sphere acts as an attractant
(3) Cover sphere with tanglefoot to capture flies
iv) EPPS Biting Fly Barrier trap
(1) Many flies circle before landing
(2) Fly circles and tries to fly through center of trap
(3) Flies hit clear deflector panels
(4) Fall into soapy water
v) Manitoba Canopy trap
(1) Uses a sphere and a conical canopy
(2) Things that affect species caught
(a) Height off ground
(b) Color of sphere
(c) Material used in canopy
vi) Box trap
(1) Blue or black painted box with open bottom and clear or screened top
(2) Mimics a large animal
(3) Flies try to land at the bottom of trap then fly up and are trapped in box
(4) Octenol is often used as an attractant

vii) Nzi trap
(1) www.nzitrap.com
(2) Primarily for tsetse control
(3) Also works for tabanids and stable flies
viii) Stick patches for deer fly
(1) http://www.instructables.com/id/Deer-Fly-Traps/
(2) http://www.deerflypatches.com/
ix) Stable flies are attracted to corrugated cardboard

5) Return of WNV – Jeff Heusel
a) No WNV had been detected in Chatham County since 2007
b) In 2011
i) Earliest detection – June 20
ii) Highest total positive pools – 214
iii) NOT the most mosquitoes sent in for testing
iv) Highest percentage positive pools – 5.6%
v) Same number of human cases as 2003 – 9
c) History of WNV surveillance efforts
i) Dead bird data –
(1) Originally a good indicator of activity
(2) Used to determine surveillance areas
(3) Decreased in importance
(a) Lack of reporting??
(b) Immunity in birds??
(c) Mutation in virus??
ii) Sentinel program
(1) Early use of sentinel chickens
(2) Determined not to be effective
iii) Larval surveys
(1) Identified potential WNV vector breeding sites
(2) Targeted *Culex* spp
(3) Changed a lot of what was done in the program
iv) Light traps
(1) Used initially
(2) Not likely to detect virus
(a) Not great for Culex surveillance
(b) Most mosquitoes are not blood fed
v) Gravid traps
(1) 26 locations for gravid trapping
(2) Trapped on a weekly basis
(3) Attract blood fed *Culex* spp
vi) Mosquito ID and testing
(1) One of the most important tools for WNV surveillance
(2) Originally confirmed the primary WNV vector
(3) Forecasts areas of risk
(4) Helps to prioritize spray missions
d) Summary of past and current WNV activity
i) Virus first detected in mosquito pools in 2002

ii) Banner year was 2003
iii) Spotty activity after 2004
iv) No viral positive mosquitoes detected after 2007
v) Activity started earlier than usual and has continued
vi) Defined WNV areas within the county

e) Action Plan
   i) Larviciding
      (1) Treatment thresholds
         (a) Number of quincs per trap
         (b) Any current WNV activity in county
         (c) Trap location in relation to the WNV activity
      (2) Hot Zone
         (a) Old part of Savannah where old infrastructure occurs
         (b) Area where catch basins are treated – 12,000 treated every 30 days
         (c) Alternate Altosid and Bs
         (d) 2011 – began treating with both products
   ii) Adulticiding
      (1) Primarily by helicopter just prior to sunset
      (2) Pesticide – naled
      (3) Resistance issues with local quincs vs malathion and many pyrethroids
      (4) Current thresholds
         (a) >300 – quincs in trap
         (b) >200 – quincs in trap; WNV activity in county
         (c) >100 – quincs in trap; WNV in area
      (5) Treated 2 and 3 times a week during peak transmission

f) Conclusion
   i) Flexibility is a must
   ii) Review, review, review
   iii) If you need help, ask for it
   iv) Be willing to change

6) Advances in Wolbachia-based Biological Control of Mosquitoes - Dr. Eric Chambers
   a) What's the problem - Lymphatic filariasis
      i) Global distribution
      ii) Endemic in 83 countries
         (1) 120 million infected
         (2) 1 billion at risk
      iii) Exclusively human disease
         (1) Debilitating
         (2) Chronic symptoms occur
      iv) 3 parasites involved
         *(1) Wuchereria bancrofti*
         (2) *Brugia malayi*
         (3) *Brugia timori*
      v) Control works well in some areas but not in others
         (1) South Pacific Islands are many, small, and isolated
         (2) Many potential vectors
         (3) Both periodic and sub-periodic behavior of microfilaria

b) Study
    *i) Aedes polynesiensis*
        (1) Highly exophilic
        (2) Day-biter
        (3) Found only on the islands of the south Pacific
    ii) Epidemiological data
        (1) Infection rates continue to be >10%
        (2) Vector control is difficult
            (a) Multiple breeding sites
            (b) Efficiency as a vector increases as the microfilarial load decreases
            (c) Administering the drug actually makes the vector
    iii) Biological control using incompatible insect technique
        (1) Mosquitoes infected with *Wolbachia pipentis*
        (2) Maternally inherited
        (3) Does not infect vertebrates
c) More on cytoplasmic incompatibility
    i) Bidirectional
    ii) If either an infected male or an infected female is involved in the mating, there are no progeny
    iii) Building a better mosquito
        *(1) Aedes polynesiensis* usually has an "a" type Wolbachia (AP)
        (2) Breed a mosquito with an entirely different type of Wolbachia
            (a) Kill off normal Wolbachia
            (b) Infect with novel Wolbachia
            (c) Breed up a batch of CP mosquitoes
        (3) Observe crossing patterns
            (a) CP x AP = no progeny
            (b) Population cage tests
                (i) As time progresses, the population drops to zero
                (ii) Control cage numbers continue to increase
d) Field work
    i) Med Ent Research Station in Tahiti
    ii) Semi-field testing
        (1) Lab strains may have lower relative fitness compared to wild type
        (2) Experimental design – field cages
            (a) Male competitiveness assay
            (b) Same results as in lab
e) Conclusions
    i) Results were positive
    ii) Mass rearing of CP mosquitoes was next
    iii) Release sites were on uninhabited islands
f) Benefits
    i) Only males released
    ii) Not transgenic
    iii) Species specific
g) Lots of work is still needed to be done

7) Pesticide Environmental Stewardship Program Update – Rosmarie Kelly

a) New way of collecting data
b) Check out survey link on the GMCA website

**Friday, October 21, 2011**

1) Bti Efficacy – Joe Iburg
   a) Impact of seston on the susceptibility of black fly larvae to Bti
      i) Good control in the field except at a few locations
      ii) Study aimed at looking for a reason
         (1) Looked at river substrate
         (2) Looked at suspended matter
         (3) Looked at dissolved matter
      iii) Seston is the particulate matter suspended in bodies of water such as lakes and seas. It applies to all particulates, including plankton, organic detritus, and inorganic material.
      iv) Larvae feed continually on materials suspended in the water column
      v) Water flow moves Bti past them
      vi) Window of control opportunity is short
   b) Study 1
      i) Methods
         (1) 2009-2010
         (2) Took water from northern branch of the Susquehanna River
         (3) Filtered water
         (4) Seston resuspended in deionized water
      ii) Larval media used
         (1) River water
         (2) River filtrate
         (3) DI water
         (4) DI water with re-suspended seston
      iii) Test
         (1) Controlled current toxicity test
         (2) Done in shaker system with different media
         (3) Added Bti for a known time period
      iv) Results
         (1) Dissolved content did not have an effect on mortality
         (2) Re-suspended solids were causing a decrease in mortality
         (3) Turbidity also had an effect
   c) Study 2
      i) Clay minerals
         (1) Added different clay minerals to the larval media
         (2) No difference was found due to addition of clay minerals
      ii) Cellulose
         (1) Secondary waste fibers are often discharged into waterways from paper mills
         (2) Numerous paper mills are found along the Susquehanna River
         (3) Cellulose causes black fly to stop feeding for a short period
         (4) Saw some effect

iii) Electron microscopy
(1) Diatoms!
(a) Extremely sensitive to environmental conditions
(b) Black fly larvae feed on them
(c) Blooms occur based on organic material in water
(d) Multiple sewage plants occur along the river
(2) Needed to look more closely at the effect of diatom blooms
(3) 2 basic types of diatoms found
iv) Study 3
(1) Added each of the different type of diatoms to the larval media
(2) Saw a reduction in mortality
(3) Dose dependent

d) Hypothesis
i) Altered feeding behavior occurs in the presence of some materials but not others – retraction of cephalic fans
ii) Food competition
(1) High turbidity probably reduces the chance of feeding on the Bti
(2) Slower rate of feeding due to high nutrient loads
(3) Cessation of feeding when the gut is full

e) Study 4
i) Used DayGlo particles to stand in for Bti
ii) Looked at length of DayGlo band /full length of gut x 100 to get a percent feeding
iii) Lower percentage equals less feeding
iv) Diatoms did cause feeding behavior to change

f) More work to be done

2) Update on the College of Agricultural and Environmental Sciences – Robert Shulstad
a) http://en.wikipedia.org/wiki/University_of_Georgia_College_of_Agricultural_and_Environmental_Sciences
b) College ranked 4th in the nation
c) Extension service is in the top 5 in the Nation
d) Provide a product that the Industry wants
i) Pure Research
ii) Applied Research
e) Farmers, specialists, and researchers all work together
f) Bring in a lot of outside support
g) Royalties
i) Plant patents
ii) Primarily peanuts
h) Experiment Station
i) Support of legislation
ii) Funding is through a line item in the budget
i) Restructuring is occurring
i) Extension services
ii) Research faculty
j) Base funding is at risk due to Government budget cuts
k) State population is changing

l) Hot topics
    i) Biofuels
    ii) Genomics/genetics
    iii) Nutrition and dietary changes

3) Mosquito Control and Honey Bees – Robert Moulis
    a) Honey bee background
        i) Non-native
        ii) Introduced in the 1600
        iii) Social insects
            (1) One queen
            (2) Drones (haploid males)
                (a) Come from infertile eggs
                (b) Short-lived
            (3) Workers (females)
        iv) Larva-pupa-adult
            (1) Larvae fed pollen and honey
            (2) Pupal cell is capped
            (3) Egg to adult ~20 days
        v) Caste system
        vi) Strong colony contains 40,000 to 80,000 bees
        vii) Important pollinators
        viii) Problems
            (1) Arthropods
            (2) Bacteria, virus, fungi
            (3) Mice
            (4) Colony Collapse Disorder
            (5) Pesticides
    b) Bee hives
        i) Kept by hobbyists and as a business
        ii) Hives are filled with wax-covered frames
        iii) Coastal Georgia - www.cebeekeeping.com
        iv) Need a good relationship with local beekeepers
            (1) Attend local beekeepers meeting
            (2) Check with the local extension agent
            (3) Keep lines of communication open
            (4) Deal with issues promptly
            (5) Be honest about the reality of the situation
    c) How Chatham County Mosquito Control deals with bees?
        i) Map hive locations
            (1) Commercial
                (a) Many hives
                (b) Move them
            (2) Backyard
                (a) Few hives
                (b) Stay in one place
        ii) Look at the pesticide label
            (1) Toxicity to bees

(2) Susceptibility / conflicts
(a) Bees are active during the day
(b) Potential conflict during swarming
(c) Pesticide on flowers can cause a problem
(d) During very hot evenings the bees will be outside on the hive
iii) Courtesy call list
iv) Visit local beekeepers
v) Might be able to exclude areas – No Spray Zones
vi) Suggest backyard beekeepers have hive canopy to prevent drift from coming into contact with the hive

d) Some mortality will likely occur anyway
e) A strong beehive can take some mortality without any reduction in production
f) Legislation
i) Some states have laws protecting bee hives
ii) Mosquito control is often exempt
g) Some literature
i) http://www.extension.umn.edu/honeybees/components/pdfs/posters/ProtectionPesticides.pdf
ii) http://www.ok.gov/~okag/forms/cps/beeprotect.pdf
iii) http://www.clemson.edu/public/regulatory/pesticide_regulation/bulletins/bulletin_5_protecting_honeybees.pdf
iv) http://www.suite101.com/article.cfm/beekeeping_bees/66699

4) Mules and Pools – Fred Koehle
a) Richmond County Mosquito Control
b) Part of the Richmond County Environmental Health Department
c) Pools
i) 112 in system
(1) Maintenance – 7
(2) In court – 4
(3) Completed – 92
(4) In process – 9
ii) Process
(1) Talk to owner
(2) Inspect
(3) Send letter requiring work done
(4) Re-inspect in 30 days
(5) Send letter
(a) Thank you letter
(b) Need to improve letter
(6) Re-inspect in 15 days
(7) Send letter
(a) Thank you letter
(b) Need to improve letter
(8) Citation sent
(9) Court
(a) Need to be able to work with the court system
(b) Need to be able to work well with Code Enforcement

(c) Judges work well with mosquito control

d) Kawasaki Mule
   i) Used for barrier spray application downtown
   ii) Mounted a swivel chair in back of mule
   iii) Converted agriculture tank with long hose
   iv) Barrier spray
      (1) Flit 13.3
         (a) Active ingredient is permethrin
         (b) Do not spray anything that is blooming or about to bloom
         (c) Spay vegetation
         (d) http://www.clarke.com/index.php?option=com_content&view=category&layout=blog&id=55&Itemid=136
      (2) Can shut down spray when people are around
      (3) Done on Fridays
      (4) Reapply every 6 weeks
   v) Also use the mules to larvicide the storm drains
      (1) Altosid
      (2) Duplex
   vi) Benefits
      (1) Mule uses 7/10$^{th}$ of a gallon per hour
      (2) Cost comparison
         (a) Truck - $1.404 per storm drain
         (b) Mule – $0.84 per storm drain
      (3) Total cost savings was over $8000
      (4) The Mule paid for itself after one application of larvicide

5) NPDES Update – Ros Kelly

**Association Business Meeting**

Officers 2012

1) President – Bobby Moulis
2) VP – Fred Koehle
3) S/T – Jerry DeRamus
4) Directors
   a) 1 year – Ian Brown
   b) 2 year – Alan Gaines
   c) 3 year – Jeff Heusel
5) Industry Rep – Charlie Pate
6) Other reps
   a) Extension – Elmer Gray
   b) Public Health – Rosmarie Kelly