Georgia Mosquito Control Association
32nd Annual Meeting
October 21-23, 2009

October 21, 2009

FIRST SESSION

1) Washington Day – Mark Blackmore
    a) Clean Water Act issue
    b) Will no longer exempt public health pesticides
    c) Permitting process may be required
        i) Unfunded mandate
        ii) Regulatory costs
        iii) No permitting process exists
        iv) Will limit the ability control mosquitoes
            (1) Proactive public health/disease control
            (2) Tourism and nuisance species
            (3) Emergency mosquito control
        v) Potential for lawsuits
    d) Response
        i) AMCA letters to the Governor for pesticide end-users
        ii) Organizational letters
        iii) Educate public
2) AMCA Update: 75 Years of Service – Doug Carlson
    a) Who is the AMCA
        i) Current president of AMCA
        ii) Non-profit professional association
        iii) Founded in NJ in 1935
        iv) 1700+ members
        v) International in scope – 52 countries
    b) What does the AMCA do
        i) Lobby/advocacy for legislative and regulatory issues
            (1) Legal presence in Washington DC
            (2) Technical advisor – Joe Conlon
            (3) Washington Day
                (a) Annual event since 1999
                (b) Meet with legislative aides
                (c) Discuss important issues in mosquito control
        ii) Provides info and testimony impacting policy decisions
            (1) CWA – Clean Water Act
                (a) NPDES – National Pollution Discharge Elimination System
                (b) FIFRA – Federal Insecticide, Fungicide, Rodenticide Act
                (c) 3 circuit courts involved (http://www.uscourts.gov/courtlinks/)
                    (i) March 2001 – 9th Circuit Court

1. Ruled that pesticide discharges into US waters required a permit specific to an irrigation district
2. Nov 2002 – 9th Circuit Court issued another opinion specific to the US Forest Service
3. 2002 – 2nd Circuit Court issued a decision concerning a need for a NPDES permit for mosquito control in federal wetland areas
4. 2005 – 9th Circuit Court held that a pesticide applied consistent with FIFRA was not a pollutant
5. Nov 2006 – EPA
   a. Permit not need to control mosquito larvae
   b. Application covered under FIFRA
6. Lawsuits filed in 11 of 13 Circuit Courts by both pesticide industry and anti-pesticide group
7. Jan 2009 – 6th Circuit Court ruled
   a. Not all pesticides are pollutants but all biological pesticides are pollutants
   b. Residues are pollutants
8. EPA is developing an NPDES permit for the application of pesticides to the waters of the US
9. Cotton Industry is in appeal
10. AMCA is filing an amicus

(d) Costs?
(i) Length of permit
(ii) Number of permits needed
(iii) Monitoring costs
(iv) How fast can a permit be obtained

(2) WNV
(3) Wildlife Refuge issues (NFWS)
(4) EPA – PESP program
(a) Reduction of pesticide risk
(b) AMCA partners with EPA

iii) Education
(1) Publications
(a) JAMCA
(b) WingBeats
(c) Bulletins
(d) Newsletter
(e) Webinars
(2) Annual meeting
(a) March 28-April 1, 2010 – Lexington KY
(b) March 20-24, 2011 - Anaheim CA
(c) 2012 – Texas
(d) 2013 - NJ

iv) Works with mosquito control industry
v) Public relations
(1) PSAs

(2) “I’m One” program for WNV awareness
(3) National Mosquito Control Awareness week
(a) Annual event
(b) 2010: June 20-26
(c) Focus on the importance of mosquito control
vi) Website – www.mosquito.org

3) Historical Perspectives on Mosquito Control in Indian River County, FL – John Beidler
   a) Started at Indian River in 1955
      i) Commission program
      ii) Oscar Fultz, later director of the Chatham County program, worked at Indian River
      iii) Developed a 5-yr plan
      iv) Put research money into the budget
   b) Resistance to DDT had developed
   c) Mosquitoes were very bad –
      i) Landing rates of 50 a minute were common
      ii) 40,000 acres to control
   d) Control measures used
      i) A lot of changes were needed
      ii) Switched to thermal foggers and malathion and got excellent control
      iii) Source reduction – ditching to give minnows access to wetland areas
      iv) Diking and flooding for salt marsh mosquitoes
         (1) Environmental issues
         (2) Looked for research to be done to find best management practices
   e) Lots of good stories ☺ including an elephant and explosions
4) INDUSTRY SPOTLIGHT
   a) Bayer Environmental Science – Don Bodkin
      i) Adulticide products
      ii) Involved in reregistration of active ingredients
         (1) Permethrin
         (2) Resmithrin
   b) B&G Chemical
   c) AllPro Vector Control Group – David Sykes
      i) Manufacturer/formulator
      ii) Now selling direct
         (1) Aqualure
         (2) Evolure (oil-based)
         (3) Provent
         (4) Imbion – new product
            (a) Water and oil dilutable
            (b) 30-30
5) Environmental Stewardship along FL Indian River Lagoon – Doug Carlson
   a) Goal – reduce pesticide risk (PESP program)
   b) Balance mosquito control and natural resource interests
   c) Indian River Lagoon

i) Lagoonal Estuary – fresh and salt water mix
ii) 156 miles long
iii) 5 inlets
iv) Most diverse estuary in US
v) Salt marsh and mangrove swamps – mosquito issues

d) IPM program
   i) Source reduction
      (1) Ditching dates back to the 1920s
      (2) Dredging started in middle-1900s
      (3) 1950s & 1960s – 40,000 acres of impoundments created
   ii) Larviciding
   iii) Adulticiding

e) Salt Marsh control
   i) Ditching increases water circulation
      (1) Pro
         (a) Let fish into area
         (b) Reduce oviposition appeal
      (2) Con
         (a) Become clogged with silt and debris
         (b) Fill with vegetation
         (c) Problem becomes worse
   ii) Impoundment management
      (1) Eliminates marsh area by creating diked pools
      (2) Benefits
         (a) Eliminates larvicide treatments
         (b) Benefits resident fish
         (c) Can be managed for waterfowl
         (d) Great for wading birds
      (3) Environmental issues
         (a) Interferes with water movement between marsh and estuary
         (b) Can kill native vegetation
         (c) Prevents movement of organisms
   iii) Committee created to review management plans for salt marsh projects
      (1) Multi-agency effort
      (2) Looks to balance both nature resources and mosquito control
      (3) Used available research to create a new plan
   iv) Rotational Impoundment Management (RIM)
      (1) Install water control culverts
      (2) Minimal flooding during mosquito season to reduce mosquito numbers
      (3) Open culvert to allow free exchange of water otherwise
      (4) Allows minimal pesticide use to control mosquitoes
      (5) Reestablished most natural marsh functions
   v) Surface Water Improvement & Management Act (1987)
      (1) Mosquito control partners with water management agencies
      (2) Source of funding for the RIM
      (3) Also helps fund restoration of impacted marshes

6) Adult Mosquito Ecology in Southwest Georgia – Eva Whitehead
    a) Study site – Ichauway and JW Jones Ecological Research Center
        i) 29000 acres
        ii) Long leaf pine and wiregrass ecosystem
        iii) History
            (1) Emory University Field Station
            (2) Malaria vector studies
    b) Current project
        i) 1st mosquito study at center since 1948
        ii) Objectives
            (1) Spatial variation
                (a) 9 land use/cover categories
                (b) Spatial analysis - ArcGIS
                (c) Cluster analysis - PCOrg
                (d) Indicator species analysis – PCOrg
                (e) Focused on 11 different species
            (2) Arbovirus prevalence
                (a) Trapping
                    (i) Collected using gravid and CO_2-baited light traps
                    (ii) Backpack aspirator/resting boxes
                (b) Virus isolation
            (3) Host feeding patterns
                (a) Blood-fed females
                (b)
        iii) Results
            (1) Mosquitoes
                (a) Collected 30 different mosquito species
                (b) 9 genera
                (c) 4 species made up ~80% of collection
            (2) Analyses
                (a) Cluster analysis - sites clustered into 3 groups
                    (i) 1 – forested wetlands
                    (ii) 2 – wetland
                    (iii) 3 – agricultural sites near residential areas
                (b) Indicator Species analysis
                    (i) *Ps ferox* – site 1
                    (ii) *Cq perturbans* – site 2
                    (iii) *Culex* spp – site 3
            (3) Arboviral testing
                (a) 987 pools tested
                (b) 1 pool WNV+ (quinces) – associated with agriculture
                (c) 3 pools POTV+
                    (i) Associated with forested area
                    (ii) 2 pools *Ae vexans*
                    (iii) 1 pool *An punctipennis*
                (d) Low arboviral prevalence

(i) High bird diversity?
(ii) Time of year?
(iii) Associated with land use type/change?

(4) Bloodmeal analysis
(a) 190 blood-feds collected
(b) 148 hosts identified
(c) 143 fed on mammals
(i) 9 mammalian hosts identified
(ii) 91% blood meals were from white-tailed deer
(d) 5 fed on birds
(i) 5 different bird species fed on
(ii) High bird diversity in area

7) The Delivery of *Bacillus thuringiensis* i*sraelensis* (Bti) to Adult Mosquitoes – Bannie Hulsey (Tom Kollars)
a) Focus on malaria and dengue control
i) 1-3 million people contract malaria every year
ii) 50 – 100 million cases or dengue and 500,000 cases of DHF per year
iii) Biggest impact is to children
iv) Other regionally important vector-borne diseases
b) No current technique is entirely effective
c) Provector Bt– adult mosquito control
i) Developed by Dr Tom Kollars at MEVLABS, Inc
ii) How does it work
(1) Flower mimic
(a) Visual cues
(i) Color decal
(ii) Flower is black
(b) Olfactory clues - chemical attractants
(2) Used indoors
(3) Armed with Bti disk
(a) Lasts 6 months
(b) Potentially kills 10,000 mosquitoes
(4) Mosquitoes feed on "flower" and die
iii) No non-target effects
iv) Lab test results
(1) *Ae aegypti* – 80% kill rate
(2) *Anopheles* – virtually all mosquitoes die in a few days
v) Georgia Field Study
(1) Setup
(a) 16 tents set in a grid
(b) Provector at each tent
(c) Traps around "village"
(d) Control site
(2) Results – significant reduction at test site (3x lower mosquito populations)
vi) Many other study sites in other countries to look at

(1) Efficacy and community effects
(2) Number needed to provide disease control

d) Bottom Line
i) ~$8 each
ii) Targeted to mosquitoes
iii) Recommended to be used with other methods of control

8) New Larvicide Trials – Jim McNelly
a) Natular
i) New larvicide from Clarke
ii) Dow Ag ferments the product
b) History
i) 1982 – Caribbean rum still soil collections
ii) 1986 – identified *S spinosa* in soil sample
iii) 1987 – metabolites identified
(1) Spinosyn A and B
(2) 2 most active metabolites
iv) 1995 – spinosad classified as a reduced risk pesticide product
v) 1997 – frst spinosad-based product registered
vi) 1999 – Presidential Green Chemistry Challenge Award
c) Clarke's Syewardship Challenge
i) Inert ingredient goals
(1) List 4 (minimal/reduced risk)
(2) NOP – National Organic Program (USDA)
ii) Reduced risk review
iii) Section 3 registration
iv) Organic Grower registration (OMRI listing)
d) Formulations
i) XRG (OMRI)
ii) G (in review)
iii) EC (in review)
iv) XRT (OMRI)
v) T30 (OMRI)
vi) DT – international registration
e) 2009 – managed rollout
i) Dynamic protocols
ii) 13 mosquito species targeted
iii) KY – container breeders
(1) >90% control within 24 hours
(2) ~100% control by 72 hours
iv) KY – floodwater species
(1) Similar results
(2) A little slower reacting in the anophelines
v) Montana – floodwater species
(1) Granular
(2) Just under max rate
(3) By 48 hours most larvae were gone

vi) FL – saltmarsh species
    (1) At max rate
    (2) 98% control by 48 hours
vii) Illinois – pretreatment application
    (1) Ae vexans site – dry when treated
    (2) Treated sites showed essentially no larvae for up to 30 days
viii) Illinois – retention pond
    (1) *Culex* spp
    (2) Similar results
ix) MN – small ground sites
    (1) Complete mortality by 48 hours
    (2) Control lasted ~5 weeks
    (3) Still had over 90% efficacy
x) NC – dredge spoil sites - similar activity as in MN

f) Summary
    i) Formulations consistently providing control
    ii) Product should be used in a rotational larvicide regime

October 22, 2009

SECOND SESSION

1) The Status of Entomology in the State of Georgia – Ray Noblet
    a) 2 programs
        i) Insect Biology – biological studies of insects
        ii) Insect Sciences – insects in their environments
            (1) Insect Ecology
            (2) Medical Entomology
            (3) IPM
            (4) Taxonomy
            (5) Forensic Entomology
            (6) Biosecurity/Biosafety
    b) What is entomology
        i) Life Science –
            (1) Genetics/genomics
            (2) Physiology
            (3) Systematics
            (4) Ecology
        ii) Applied and Agricultural Science
            (1) Agricultural pests
            (2) Honey bees
            (3) Public health aspects
    c) Almost all insects are beneficial
    d) Insect control and damage cost GA millions of dollars a year
    e) History of entomology

i) Roots in Chinese and Jewish culture
ii) Became more formalized in the 1900s

f) UGA Entomology
i) Land Grant University
ii) Mandate
(1) Teaching
(2) Research
(3) Public outreach/extension programs
iii) Variety of educational programs
iv) 3 campuses
(1) Athens - comprehensive
(2) Griffin – urban insects
(3) Tifton – agricultural
v) Core areas
(1) Pathogen interactions/vector ecology
(2) Urban issues
(a) Termites
(b) Fire ants
(c) Household ants
(d) Companion animal pests
(3) Systematics, Taxonomy, and Evolutionary Biology of Insects
(a) Beetle systematics
(b) Fire ants
(c) Thrips
(4) Wetland Ecology and Environmental Toxicology/Biology
(5) IPM and Biological Control
vi) Extension programs
(1) Public education and safety
(2) IPM for major agricultural crops
(3) Livestock/companion animal pests
(4) Fruit crops
(5) Ornamentals/turf
vii) Jobs
(1) They are available
(2) Salaries are competitive

2) Seroprevalence of Dengue Fever in US Special Operations Forces – LTC Jennifer Caci
a) Special Operations Command
i) Soldiers located in ~100 countries
ii) Small teams
iii) Most located in areas of high disease threat
(1) Visceral and cutaneous leshmaniasis
(2) Malaria
(3) Dengue
b) Dengue in general
i) Most important mosquito-borne viral disease worldwide

ii) Range increasing due to introductions of *Aedes albopictus*
iii) 4 serotypes
iv) Infection with one serotype followed by a second serotype leads to DHF or DSS
v) Full recovery can take up to a year
vi) No FDA approved rapid test
vii) No vaccine
viii) In the last 50 years, incidence of DF/DHF has increased 30-fold

c) Dengue Hemorrhagic Fever
   i) Associated with rapid death
      (1) High morbidity with DF
      (2) High mortality with DHF
   ii) Increasing in prevalence
   iii) 1970s – 9 countries reporting DHF
   iv) Today ~40 countries reporting DHF
   v) No rapid test for dengue complicates the issue

d) Why Special Ops
   i) Nearly continuous operations in dengue endemic areas
   ii) Multiple deployments to dengue areas not uncommon
   iii) Austere living conditions
   iv) Small teams – losing one person is critical to mission accomplishments
   v) "tough guys" won't always wear protective gear and take personal protective measures

e) Dengue in USASOC personnel
   i) Reporting is problematic, but numbers of reported cases are increasing
   ii) Cases reported in 5 of 11 soldiers from one SF unit
   iii) One Civil Affairs soldier was positive for all 4 serotypes
   iv) Difficulties in treatment
      (1) Small teams – can't remove a team member unless need is high
      (2) Removal can be problematic
      (3) Will the soldier develop DHF or DSS
      (4) Should the soldier stay to finish the mission
      (5) Difficult situation – need more info to make decisions
   v) Study
      (1) Collaborative effort
         (a) USASOC
         (b) WRAIR
         (c) AFHSC
      (2) Seroprevalence study
      (3) DoD Serum Repository samples for time line
      (4) Anonymous study
      (5) ELISA
      (6) Test for all 4 serotypes
         (a) Presence
         (b) Amount
      (7) Analysis

(a) Percentage of seropositive and seronegative
(b) Antibody prevalence
(c) Stratified by age, sex, race, etc
(8) May lead to a human subjects study
vi) What happens when the military come home
(1) Vectors for these diseases are found in the US
(2) Outbreaks could occur here
(3) Info needs to be made actionable
(a) Helps medic know how to treat soldier during epidemic
(b) Helps track disease when the soldier returns home
(4) Study will hopefully help support vaccine development
vii) Bottom line
(1) Personal protective measures are important
(a) Hard to remember to do these things when the priority is to stay alive
(b) "tough guy" mentality
(2) Reporting is critical
viii) www.promedmail.org/pls/otn/f?p=2400:1000

3) Richmond County Mosquito Control – Fred Koehle
a) A good crew is vital
b) Equipment makes a big difference to your ability to get into areas to do control
c) Programs
i) Mule Barrier Spray
ii) Truck-mounted spray for adulticiding
d) County program
i) Starts April 1st
(1) Retention/detention pond larviciding
(2) Catch basins
ii) May 1st
(1) Begin adulticiding
(2) Barrier spray
iii) Surveillance
(1) Gravid traps
(2) CDC light traps with CO_2
(3) Working on getting in-house surveillance
(4) Currently primarily complaint-driven
iv) Partnering –
(1) Work with groups to set up programs
(2) Provide training and support
(3) Current partners
(a) Augusta Solid Waste Dept
(b) Augusta Regional Airport
(c) Olin Corporation
(d) Augusta Country Club
(e) Augusta State University
(f) Augusta Golf Course

v) Pool program
(1) Number in system – 58
(2) On maintenance – 21
(3) In court – 7
(4) Completed – 32
vi) Community Involvement
(1) Christmas Parade
(2) Educational program
(a) Civic groups
(b) Schools
(c) Homeowners associations
(d) Businesses
vii) Next project - tires

4) INDUSTRY SPOTLIGHT
a) Central Life – Charlie Pate
i) Altosid
(1) larvicide
(2) Many formulations for all habitats
(3) Can pretreat
(4) Labor cost savings
(5) Means confidence, efficacy, control
ii) Zenivex
(1) Adulticide
(2) Etofenprox
(3) No PBO
(4) Similar mode to pyrethroids
(5) Low toxicity in mammals and birds
(6) Reduced risk product
(7) Rapid knockdown and kill
(8) No aquatic setbacks
b) Curtis DynaFog – Matt Tandy
i) Equipment
ii) Foggers
(1) Hand-held to truck mount
(2) Thermal and ULV
iii) Light traps
(1) Incandescent
(2) Black light
(3) Basic
iv) Sell through Univar
c) Univar – Joe Andrews
i) Bti line
ii) Altosid
iii) Adulticides
iv) Equipment

5) Working with Landowners – Ben Brewer

a) Glynn County Mosquito Control
b) Area of concern – new landowner of Little Saint Simons Island
c) Past control
    i) Marsh is ditched
        (1) Bridges were placed in dike to allow water to enter
        (2) Need maintenance
        (3) Issues with Army Corp of Engineers
        (4) Problem – Sanchopan Marsh
    ii) Aerial control – larvicide
    iii) ULV machine on island
    iv) Hand-held fogger
d) Problems
    i) Ecological Advisory Council – would rather do nothing
    ii) Eco-tourism
    iii) Issues
        (1) Stopped adulticide
        (2) Took horses off island
        (3) Hogs trapped
        (4) Raccoons killed
        (5) Deer killed
        (6) Protect birds
        (7) Organic garden
    iv) What they want
        (1) Better data
        (2) Proof of problem
        (3) They OWN marsh
    v) Lesson learned
        (1) 1st meeting – introduce yourself and program
        (2) Next time – ask for things
e) New strategy
    i) Problem
        (1) Is it worth larviciding the area if the whole area can't be done
        (2) Will need to adulticide anyway
    ii) LSSI staff now larvicides
    iii) Surveillance
    iv) Meet will individuals on council
    v) Explore island
    vi) Modify plans to suite council
    vii) ACT HAPPY
f) June 24, 2009
    i) Organic garden flooded
    ii) Lots of mosquito breeding
    iii) Getting calls from LSSI
    iv) Aerial larviciding done
g) Hydrology and ditching
    i) Problem – lots of water comes in, not much goes out

ii) Need to get water in and out with tidal flow for a healthy marsh
h) Need to sell your program
i) Take home message – mosquitoes do not necessarily stay where they emerge

6) Brown Recluse Spider Distribution in Georgia – Ray King and Nancy Hinkle
   a) Background
      i) The spider
         (1) Vary in color from chocolate brown to yellow brown
         (2) 6 eyes in pairs
            (a) Each eye same size as others
            (b) Evenly spaced
         (3) No pronounced stripes
         (4) No spines
         (5) Medium sized spider
         (6) Web
            (a) Loose
            (b) Patternless
            (c) Do not wrap prey in silk
         (7) 13 species
         (8) 4 species involved in human bite reports
      ii) Bite
         (1) ~10% cause tissue damage
         (2) Most cause no problem
         (3) No proven brown recluse deaths
         (4) Very over-diagnosed
         (5) Shy and retiring spiders
         (6) Phospholipase enzyme causes damage
      iii) Habitat
         (1) Sheltered areas
         (2) Low moisture level
         (3) Low lighting
      iv) Life cycle
         (1) Live up to 2 years in captivity
         (2) Egg sacs in May
      v) Species confused with brown recluse
         (1) Salticids – jumping spiders
         (2) Southern house spider – esp male
         (3) Spitting spiders
         (4) Lycosids - Wolf spiders
         (5) Dystera spp – woodlouse spider
         (6) Pholcidae – cellar spiders
         (7) Linyphiidae – sheet weavers
         (8) Barn spider
   b) The 7-year study
      i) Found 19 brown recluse spider in the whole state of Georgia
      ii) Over 2000 spiders submitted
         (1) >1000 were southern house spiders

(2) 2nd most commonly found – American house spider
(3) 3rd – long-bodied cellar spider

iii) Bites very over-diagnosed
(1) Other problems
(a) Sweet's diseases (autoimmune disease)
(b) MRSA
(c) Many other things
(2) 2001-2005
(a) >963 bites reported
(b) 103 counties reporting

iv) Where were brown recluse found
(1) 58 specimens in recorded history in north GA above the Fall Line
(a) 2 dozen recorded from one house
(b) All 19 found in 7-year study were collected above Fall Line
(2) 2 specimens below Fall Line were most likely brought in from outside
(3) Correlation is between number of people and bite complaints, NOT number of spiders and bite complaints
(4) See maps in talk

v) Need a spider ID'ed? Send it to UGA

THIRD SESSION

1) Urban Stream Pollution Increases Mosquito Fitness and Disease Vector Potential – Carolyn Keogh
a) Recent and current projects
i) Part of the CSO project
ii) First study – Lisa Calhoun et al
iii) www.envs.emory.edu/research/WNV/index.htm
b) Determinants of mosquito fitness
i) Adult survival
ii) Adult fecundity
iii) Juvenile survival
iv) Juvenile fecundity
(1) Larval nutrition
(2) Body size
v) Female oviposition choices
c) The study
i) Semi-natural study
ii) Oviposition in CSO vs non-CSO water
(1) Put fake CSO pools near CSO
(a) Looked at tap water vs CSO water
(b) 2x2 factorial design
(c) 4 treatments
(i) Just CSO water
(ii) Just tap water
(iii) Added nutrients to both
(d) Counted and removed egg rafts

(2) Same time frame to eliminate seasonal differences
(3) Counted number of eggs

iii) Looked at effect of habitat size on oviposition preference
(1) Questions to answer
(a) Does the amount of water make a difference
(b) Presence or absence of con-specifics
(2) Design:
(a) 2 factors by 2 levels
(b) 4 clusters of 10 5 gallon tubs
(c) 3 gallons of water
(d) Set tubs in woods
(3) Counted egg rafts daily for an 8-day period
(a) 1st 8-day period – egg rafts left in tub
(b) 2nd 8-day period – egg rafts removed daily
(4) Analyses
(a) Split-plot linear mixed effects model
(b) Random factors
(i) Cluster
(ii) Error
(c) Fixed factors
(i) Nutrients,
(ii) Water quality
(iii) Number replicated

iv) Results
(1) No significant difference between number of egg rafts between CSO vs tap water overall
(2) Addition of nutrients is important
(3) There does seem to be a con-specifics effect but more work needs to be done
(4) Variability is at the level of an individual container

v) Conclusions
(1) Nutrient availability most important
(2) Oviposition medium seems to be the biggest factor driving oviposition site choice
(3) Preference for CSO water
(4) J Med Entomol. 46 (2): 220-226 (2009)

vi) Future studies
(1) Effect of larval habitat on fitness
(a) Fitness
(b) Time to emergence
(c) Body size
(d) Sex ratio
(2) Interactions with other stream inverts
(3) Density interactions

2) A New Cost Effective Mosquito Aspirator – Gonzalo Prokopec
a) Need good surveillance to do good control

b) Adult collection
    i) Type of collecting
        (1) Indoor vs outdoor
        (2) Passive vs active
        (3) Sampling vs control
    ii) Trapping vs aspiration
        (1) Traps
            (a) Gravid
            (b) Light
        (2) Aspiration
        (3) Landing counts
    iii) All collection types differ in sensitivity and collect certain species, ages and physiological states
c) Aspiration
    i) Resting adult population
    ii) Most suitable for indoor collections
    iii) Unbiased estimate of species richness
    iv) Technology
        (1) CDC-Backpack aspirator (Gubler & Clarke, 1994)
            (a) Pros
                (i) Unbiased collection
                (ii) Bloodfed females
                (iii) High coverage
                (iv) Indoor/outdoor
                (v) Estimates of richness
                (vi) High sensitivity
            (b) Cons
                (i) Heavy
                (ii) Rigid and non-extendable
                (iii) Costly
        (2) Prokopack aspirator
            (a) Smaller
            (b) Light-weight
            (c) Cheaper
            (d) Uses a smaller battery
            (e) Telescopic extension
            (f) Same aspiration capacity as the CDC-Backpack aspirator (CDC-BP)
    v) How the Prokopack (PKP) was conceived
        (1) Study
            (a) Overwintering in CSOs
            (b) Looking to stratify of collection
                (i) Ceiling
                (ii) Top half of wall
                (iii) Lower half of wall
            (c) ~5 m high ceilings
        (2) Needed

(a) Smaller aspirator to get into difficult sites
(b) Lighter weight for long hours
(c) Extendable to reach high on walls and ceilings
(3) Features
(a) Weight:
(i) 0.88 kg
(ii) 4 kg with battery
(b) Cost ~$40
(c) Extension pole

d) Prokopack tests
i) Atlanta CSO tunnels
(1) Collection done previously using CDC-Backpack aspirator
(2) Prokopack increased number of mosquitoes caught
(3) Why - most of mosquitoes were on ceiling
ii) Iquitos, Peru
(1) Indoor collections
(2) Paired trial between CDC-Backpack and Prokopack
(3) 10 minutes per house
(4) 71 houses
(5) Design
(a) Prokopack on ceiling
(b) Either CDC-Backpack or Prokopack used first in each house
(6) Results
(a) PKP collected more mosquitoes
(b) Overall collections was not significant
(c) Collected more mosquitoes of most species than the CDC-BP
(d) Relates to accessibility
(7) Importance
(a) Dengue can be transmitted at very low levels in houses
(b) CDC-BP underestimates number of mosquitoes in house
iii) Atlanta backyard collections
(1) Allows stratification of collection
(2) Ongoing

e) Commercial aspects
i) Emory submitted patent in Oct 09
ii) Searching for company to build and market PKP
iii) Want to keep PKP inexpensive

3) A Peek Into Our Program: the DeKalb Experience – Juanette Willis
a) DeKalb stats
i) Demographics
(1) >700,000 residents
(2) 54% black
(3) 17% foreign-born
(4) 20% do not speak English at home
ii) Most densely populated county in GA
iii) Many important landmarks

iv) Sites of interest
    (1) CDC
    (2) Emory
    (3) Stone Mt Park

b) The BOH Mission
    i) Prevent virus infection in people
    ii) Not to control mosquitoes

c) Seasonal program
    i) 9 Interns
    ii) Part-time entomologist
    iii) Supervisor
    iv) Arboviral coordinator

d) Strategy
    i) Public education
        (1) Health fairs
        (2) Door-to-door
        (3) Media events
        (4) Press releases
        (5) School programs
        (6) 1-page program update for commissioners

e) Website - www.dekalbhealth.net
        (1) Priority facilities
            (a) Provide an assessment
            (b) Larvicide
            (c) Provide WNV information
    ii) Surveillance
        (1) Trapping
            (a) Primary – gravid traps
            (b) Also have light traps
            (c) Dippers
            (d) Aspirator
        (2) 24 trap locations
        (3) Count, sort and ID
        (4) Some sent for virus testing
        (5) Respond to
            (a) Increases in mosquito numbers
            (b) Positive pools
            (c) Dead bird clusters
    iii) Control
        (1) Larvicide
            (a) Storm drains
            (b) Retention/detention ponds
        (2) Yard survey

f) Results
    i) Low numbers of cases
    ii) Program is very transparent

iii) Commissioners are happy
iv) Residents are happy

g) ***Presentation on ArcGIS Explorer***

4) INDUSTRY SPOTLIGHT
   a) AMVAC – Peter Connelly
   b) Adapco – Trey English
      i) Zenivex
         (1) New class of product
         (2) No PBO
         (3) Low rates
      ii) Mosquito database management
      iii) Service
         (1) Calibration
         (2) Repair
         (3) Other
      iv) On Facebook
   c) Valent – Candace Royals
      i) Larvicides
         (1) Vectobac Bti
         (2) Vectolex – B sphaericus
      ii) New product – vectomax (Bti and sphaericus combined)
5) Ground ULV and Equipment Calibration - David Sykes
   a) History of thermal fogging
      i) WWII technology
      ii) First tests by Latta and LaMer ca 1945
      iii) Mix of insecticide and carrying agent
         (1) DDT
         (2) Diesel or kerosene
      iv) 1946 – Todd Shipyard made a thermal mosquito fogger
   b) Benefits
      i) Small drops
      ii) Good penetration
      iii) Easy to see fog
   c) History of ULV Aerosols
      i) Developed during the 1960s
      ii) 1st papers presented at meetings by Dr Gary Mount in 1970s
      iii) 1966 – machine developed by US Navy and Dept of Agriculture
   d) Thermal vs ULV
      i) ULV safer in traffic
      ii) Both useful technology
   e) ULV types
      i) Low pressure nozzle
      ii) High pressure nozzles
         (1) Came out for a short time
         (2) Needed really high pressure to get right size droplets
      iii) Rotary atomizer

iv) Small sprayers
v) Backpack sprayers
vi) Multi-purpose sprayers
vii) Electric foggers
viii) Aerial ULV
ix) Push vs pull systems

f) Maintenance
    i) Check beginning of season and halfway through season
    ii) Check
        (1) Belts
        (2) Chemical lines
        (3) Fittings
    iii) Keep exterior clean
    iv) CALIBRATE – label is the law
        (1) Chemical flow rates
        (2) Droplet size
            (a) Variety of methods
            (b) Best method is the laser
            (c) Other good method DCIII hotwire
g) Pumping systems
    i) Flow meters
    ii) SCAMP
    iii) Leco VF and CF
    iv) Others
h) Tracking/mapping options available
i) Outcome
    i) Droplets must impinge on mosquito
    ii) Insecticide is moved by air currents
    iii) Droplets need to be small enough to drift
    iv) Need to be large enough to contain a lethal dose of insecticide
j) Best time to spray – inversion with low wind speed
    i) Warm air higher than cold
    ii) Rain and wind are limiting
    iii) Timing is critical
k) Evaluate
    i) Keep good records
    ii) Do surveillance

6) From Dengue to WNV, Florida 2009 – Carina Blackmore
    a) Arboviruses in FL
        i) Flaviviruses
            (1) WNV
            (2) SLE
        ii) Alphaviruses
            (1) EEE
            (2) HJV
        iii) Dengue

b) Surveillance coordination
    i) Hospitals & clinics
    ii) Veterinary offices
    iii) Health Departments
    iv) Mosquito control programs
    v) Fish & Wildlife
    vi) Many others
c) Arbovirus Response Plan
d) Data
    i) EEE –
        (1) Primarily seen in northern part of FL
        (2) Average year
            (a) 69 horses died
            (b) 1 cassowary
            (c) 168 sentinel chickens
            (d) 3 mosquito pools
            (e) 9 live birds
        (3) No human cases in 2009
            (a) Range 0-6
            (b) Not an epidemic situation
            (c) Difficult to predict
    ii) WNV
        (1) Low incidence year
            (a) 2 human cases
            (b) 3 horse cases
            (c) 42 sentinel chickens
            (d) 2 live wild birds
        (2) Peak activity – August and September
    iii) SLE
        (1) No cases since WNV was introduced
        (2) Have one suspect case this year
        (3) Peaks in Sept and Oct
        (4) WNV outcompetes SLE in the mosquito
    iv) Dengue
        (1) Case
            (a) *Ae aegypti* is present on the Keys
            (b) NY resident diagnosed with dengue after a trip to Key West
            (c) No other known travel
        (2) Virus
            (a) Human disease – no animal host
            (b) 4 serotypes
            (c) Related to SLE and WNV
            (d) Worldwide distribution
        (3) Symptoms
            (a) Often mild and non-specific
            (b) Sudden onset of high fever

(c) Aches and pains
(d) DHF
(i) Severe abdominal pain
(ii) Death
(4) Local surveillance
(a) Found 4 additional cases
(b) High numbers of *Ae aegypti*
(c) Medical record search
(d) Serosurvey
(i) 170 homes
(ii) 240 individuals
(5) Epi Curve
(a) Shows sustained transmission
(b) Extrinsic incubation period ~1 week
(6) Challenges
(a) Dengue vs flu
(b) H1N1 is first thought of physicians and public
(7) Obstacles
(a) No vaccine
(b) Difficulty in controlling vector
(c) Free movement of people between endemic areas and FL
(8) Advantages
(a) No animal reservoir
(b) US lifestyle
(c) Established mosquito control

7) Mosquito Myths – Charlie Pate
a) Lemon Fresh Joy
i) Started in 2002
ii) A couple of drops on a plate will attract and kill mosquitoes
iii) FALSE
b) Listerine
i) Originated in Aug 2007
ii) Spraying Listerine will kill mosquitoes for days
iii) FALSE
c) Bats
i) Effective mosquito control
ii) Eat up to 600 mosquitoes per hour
iii) Came from a study by MD Tuttle in the 1950s
(1) Bats released in a room of mosquitoes at ~10 mosquitoes per minute
(2) Extrapolated to be 600 mosquitoes per hour
(3) Study looked at echolocation, not dietary preference
iv) FALSE
v) Problem – bats carry rabies
d) Purple martins
i) Effective mosquito control
ii) Purple Martin Conservation Association – feed on a diverse array of insects

iii) 7-year study
(1) Sampled insects martins were eating
(2) Day time flyers
(3) Feed on insects flying high in the air
iv) FALSE

e) Bug Zappers
i) Kill lots of mosquitoes
ii) Studies show <1% of kill is mosquito
iii) Generates aerosol of bacteria and viruses
iv) FALSE

f) Bounce
i) Acts as a mosquito repellent
ii) Contain a perfume
iii) Contain many hazardous chemicals
iv) FALSE

g) Mosquito plants
i) Actually do repel insects
ii) Concentrated oils work to repel a number of insects
iii) PARTIALLY TRUE

h) Vitamin B-1
i) Dose that is indicated is 66x recommended dose
ii) Tested by Canadian Military - no repellent value
iii) FALSE

i) Ultrasonic devices
i) Range 20-70 kHz
ii) Wider range of frequency does not work either
iii) No effect on reorienting mosquito flight
iv) FALSE

j) "Mosquito Magnet" type traps
i) Need to be maintained
ii) Cover up to an acre
iii) Key is location
(1) Put in back of lot
(2) Best place – neighbor's yard
iv) Attract mosquitoes
v) WORKS

k) Avon Skin So Soft
i) Now contains picaridin
ii) Works

l) Eating garlic, onions, bananas – none of these work

8) The Influence of Selected Antibodies on Response of Black Fly Larvae to Bti – Joe Iburg
a) Life cycle
i) Develop in flowing waters
ii) Eggs laid on vegetation
iii) Larvae attach to substrate

iv) 7 larval instars
v) Pupae attach to substrate
vi) Adults

b) Can vector diseases
c) Significant nuisance species
d) Control
   i) Susceptible to Bti
   ii) Parameters
      (1) Flow rate
      (2) Pooling
      (3) Turbidity
   iii) Algae can decrease efficacy of control
e) Factors affecting control
   i) Broderick et al – rearing lepidopteran larvae with antibiotics led to a reduction in Btk efficacy
   ii) Antibiotics are found in black fly habitats (ppb range)
f) Study – environmental levels
   i) Looked at 4 common antibiotics – human and veterinary
   ii) Control current toxicity test
      (1) Setup
         (a) 80 flasks
         (b) 195 mL larval media
         (c) 30 larvae
         (d) Antibiotic mixture or distilled water (control)
      (2) 43 to 67 hours of antibiotic expose
      (3) Added 5 mL dose of Bti for 10 minute exposure
      (4) 5 hour hold time
      (5) Assessment
         (a) No increase in mortality due to antibiotics
         (b) Antibiotic exposure had no effect on Bti
g) Study – extreme levels
   i) Antibiotics did not kill larvae
   ii) Actually saw some increase in mortality in antibiotic-exposed larvae treated with Bti
h) Conclusions – antibiotics do not appear to be causing the decrease in efficacy of Bti in black fly control

23 October 2009

FOURTH SESSION

1) International Community Projects and ProVector – Heidi Hulsey
   a) Worldwide mosquito-borne diseases are an issue
   b) Solutions
      i) Habitat modification

(1) Ditching
(2) Community cleanup
ii) Structural barriers
(1) Window screens
(2) Air conditioners
iii) Pesticides
iv) Bed nets
(1) ITNs
(2) LLINs
(3) Non-pesticide-impregnated
v) Medical interventions
vi) Future - vaccine

c) ProVector
i) Use
(1) ~7 people are thought to be protected with one flower
(2) Used indoors
(3) Low cost
(4) Long acting
(5) Rapidly reduces mosquito populations
(6) Used as part of an IMM plan
ii) Uses Bti
iii) Delivery system to adult mosquitoes
iv) 25 community projects ongoing

d) Community Programs
i) Locals are taught to assemble ProVector
ii) Looking to see how many houses need a ProVector to provide community-wide control
iii) Success rate
(1) <1 month
(2) 90-100% control

2) Alternate Adulticiding: Barrier Sprays – Joe Andrews
a) Background
i) Requires no special equipment
ii) Focuses residual treatment to mosquito resting sites
iii) Part of an IMM program

b) Part of a Barrier Spray Program
i) Readily available
ii) Non-phytotoxic
(1) Do not use on flowers
(2) Will affect beneficials
iii) Long residual
iv) Non-irritating
v) Easy to apply

c) Use
i) Around buildings
ii) Wall and plants

iii) Under decks
iv) Dark protected areas
v) Foliage near breeding sites
vi) Fences

d) Process
   i) Use properly labeled materials
   ii) Variety of sprayers available
   iii) Treat harborage areas
e) Potential treatment areas
   i) Ball parks
   ii) School perimeters
   iii) Churches
      (1) Events
      (2) Evening services
   iv) Day care centers
   v) Retirement homes
   vi) Group homes
   vii) Outdoor activity sites
   viii) Tree line adjacent to sub-divisions and other developments
f) Why add barrier treatments
   i) Can be done during regular business hours
   ii) Concentrated products are relatively inexpensive compared to ULV products
   iii) Extended residuals reduces amount of control needed
   iv) Can be used in places where ULV spraying is difficult to do
g) Data show that barrier spraying is highly effective
h) Products
   i) Microencapsulated products
      (1) Long lasting
      (2) Protects AI from environments
   ii) Variety of other products labeled for barrier use

3) Re-evolving a Taste for Blood: Climate Change and Blood-Feeding Behavior in Pitcher Plant Mosquitoes – Bill Irby
   a) Long-term study
   b) The System
      i) Purple pitcher plant, *Sarracenia purpurea*
      ii) *Wyeomyia smithii*
   c) Differences in blood feeding expression
      i) Some populations are autogenous
         (1) Obligatory – never feed on blood
         (2) Facultative – lay one batch of eggs then need a blood meal to produce additional eggs
      ii) What is driving the change in blood-feeding behavior?
      iii) Northern vs southern populations
   d) The Study
      i) Tattnall County Georgia near Claxton
      ii) Relict population of pitcher plants and mosquitoes

iii) Looked at:
    (1) Feeding behavior
    (2) Fecundity
    (3) Population genetic structure
    (4) Hexamerin expression – storage protein product
        (a) Sex pupae
        (b) Look to see if hexamerin carries over from pupa to adult
iv) Compared to populations in FL and NC
v) Found in moist bog habitats

e) Procedure
    i) Collected larvae at each site
    ii) Reared in lab
    iii) Placed adults in cages with sugar water
    iv) Allowed one round of egg laying

f) Results
    i) Hand-in-cage assay
        (1) FL mosquitoes probed and blood fed
        (2) GA mosquitoes probed but rarely blood fed
        (3) NC mosquitoes did not probe or blood feed
    ii) Egg production
    iii) Isozyme studies
        (1) Relationship between 3 populations varied
        (2) FL and GA populations fairly closely related
        (3) GA was intermediate in genetic structure
    iv) Hexamerins – more northerly populations carried more hexamerins over to adult stage
        (1) Hexamerins are insect storage proteins that are synthesized in the fat body
        (2) Utilized as an amino acid reserve during non-feeding periods of insect development or diapause
        (3)

g) Additional studies
    i) Looked at comparison of feeding rate in larvae
    ii) Looked at blood feeding behaviors
        (1) Landing – takes a long time
        (2) Exploration – takes a short time
        (3) Probing - quick
        (4) Feeding – takes a long time to start

h) Blood feeding behaviors are changing over time with the natural populations
    i) More fed
    ii) Success rate increased
    iii) Rate of depletion of hexamerins are increasing
    iv) Why
        (1) Environmental changes
            (a) Temperature – increased in study area
            (b) Precipitation – decreased in study area

(2) Long-term change
(3) Leads to greater competition between larvae in habitat

i) Other studies - Bradshaw & Holzapfel, http://www.uoregon.edu/~mosquito/
j) Work is ongoing

4) INDUSTRY SPOTLIGHT
   a) Clarke Mosquito Control – Mike Leahy
      i) Partner with Central Life and Valent
      ii) Clarke pesticides
      iii) Equipment
      iv) Emergency control
      v) NEW PRODUCT - Natular
   b) Electronic Data Solutions – Mike Swan
      i) Sentinel GIS software – filed data collection
      ii) Sell through B&G
      iii) Rep all GIS equipment needed
      iv) Business partner with ESRI
      v) Provide technological solutions to aid mosquito control
      vi) Webinars www.elecdata.com
   c) Southern Helicopter Leasing – Cliff McGowan
      i) 4 helicopters
      ii) 2 additional pilots
      iii) Available for emergency control
      iv) Available for aerial control as part of your IMM program
5) The *Anopheles quadrimaculatus* Species Complex in Southeast Georgia – Andrew Bigham
   a) Primary study site – Bulloch County
   b) Main malaria vector in Eastern US (www.cdc.gov/malaria/features/refugees.htm)
   c) Mosquito
      i) *An quadrimaculatus* found to not be a single species
      ii) 5 distinct sibling species "found" in 1997
      iii) Subtle habitat differences found for each member of the complex
      iv) Lack of quality data concerning ranges
      v) Lack of data on population change
   d) Project
      i) Collecting at 4 different sites
         (1) Bridges
         (2) Single drainage sites
      ii) Collect from each side of bridge
      iii) Backpack aspirator
      iv) Separate *Anopheles* spp from other genera
      v) Process *An quadrimaculatus* complex
   e) Processing quads
      i) Looking for good identifying characteristics
      ii) Running into some difficulties
      iii) Current identifying characteristics are hard to use

f) Goals
    i) Population ranges
    ii) Changes in populations
g) Looking into doing genetic/molecular species differentiation

6) Honey Bee Colony Collapse Update – Jennifer Berry
a) www.ent.uga.edu/bees
b) Background
    i) 2006-2007
    ii) Large commercial beekeepers seeing massive die-offs in colonies
    iii) Symptoms
        (1) Sudden loss of adults – bees were leaving hive and not returning
        (2) Queen, small cluster of newly emerged bees, and broods remain
        (3) Honey not robbed out
            (a) Weak colonies
            (b) Usually neighboring hives will rob out honey
        (4) No secondary pests, which usually move into weak hives
    iv) Initial reports from PA and FL
    v) CCD now found from coast to coast
c) Response
    i) Looked for reasons
        (1) Out of beekeeper control
            (a) Environmental pesticides
            (b) Exotic pathogens
            (c) Mite-associated viruses
            (d) Parasitic mites
            (e) Shrinking forages
        (2) Within beekeeper control
            (a) In-hive pesticides
            (b) Migratory stress
            (c) Nutrition
            (d) Decrease in genetic diversity
            (e) Management
    ii) No consistency found
d) Issues
    i) Commercially sold wax contains miticides
    ii) Introduced varroa mite
    iii) *Nosema* spp disease
    iv) Other new diseases and pests
    v) Bees shipped from coast to coast for pollination of commercial crops
        (1) Necessary for agriculture
        (2) Loss of bees would lead to a big change in our diets
    vi) Pesticide applications
        (1) Spray in late evening when bees have ceased foraging –
            (a) Mosquito control does this already
            (b) Bees usually back I hive ~1 hour before sunset
        (2) Do not contaminate blooms

(3) Avoid unintentional drift
(4) Use pesticide formulations that are listed a low hazard to bees
(5) Avoid dusts and wettable powders
(6) More an agriculture problem than a mosquito control one

vii) Bottom Line –
(1) Final answer to what CCD really is still unknown
(2) Probably is a combination of problems
(3) UGA has a grant to study this issue

BUSINESS MEETING

1) Secretary-Treasurers Report
   a) $14896 before event
   b) Holding stable
   c) Backup funds available
2) Board
   a) President: Candace Royals
   b) Vice-President: Bobby Moulis
   c) Secretary-Treasurer: Robert Seamans
   d) Members
      i) 1-year: Ben Brewer
      ii) 2-year: Shawn Taylor
      iii) 3-year: Fred Koehle
   e) Sustaining Member Rep: David Sykes
   f) Extension Rep: Elmer Gray
   g) Public Health Rep: Rosmarie Kelly
3) Website – www.GAmosquito.org
4) Thanks to our sustaining members
5) CWA issues
   a) Write letters
   b) Contact your legislator
6) PLEASE BECOME A MEMBER – pay your dues
7) 2010 meeting: Oct 20-22 in Athens