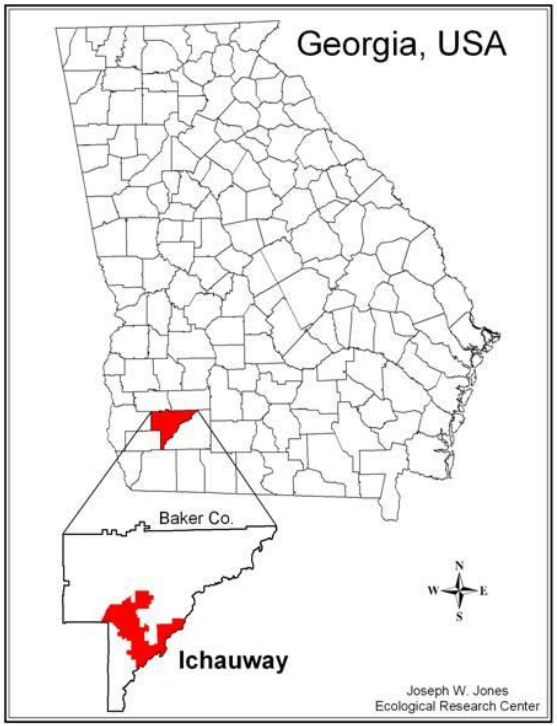
Adult mosquito ecology in southwestern Georgia

Eva Whitehead[1], Steve Golladay[2], Alan Covich[1], Daniel Mead[3], and Mark Blackmore[4]

[1]Odum School of Ecology, University of Georgia, Athens, GA
[2]J.W. Jones Ecological Research Center, Newton, GA
[3]Southeastern Cooperative Wildlife Disease Study, Athens, GA
[4]Department of Biology, Valdosta State University, Valdosta, GA

Introduction

- Ichauway and J.W. Jones Ecological Research Center
  - Coca-Cola
  - 29,000 acres
  - Long leaf pine and wiregrass
  - Extensive research projects







Introduction

- Ichauway and mosquitoes
  - Emory University Field Station

Emory University Field Station Annual Report 1946-1947

Introduction

- Project Objectives
  - Answer the following questions:
    - What factors influence the mosquito community composition?
    - What is the arbovirus prevalence?
    - What are the host-feeding patterns of mosquitoes?

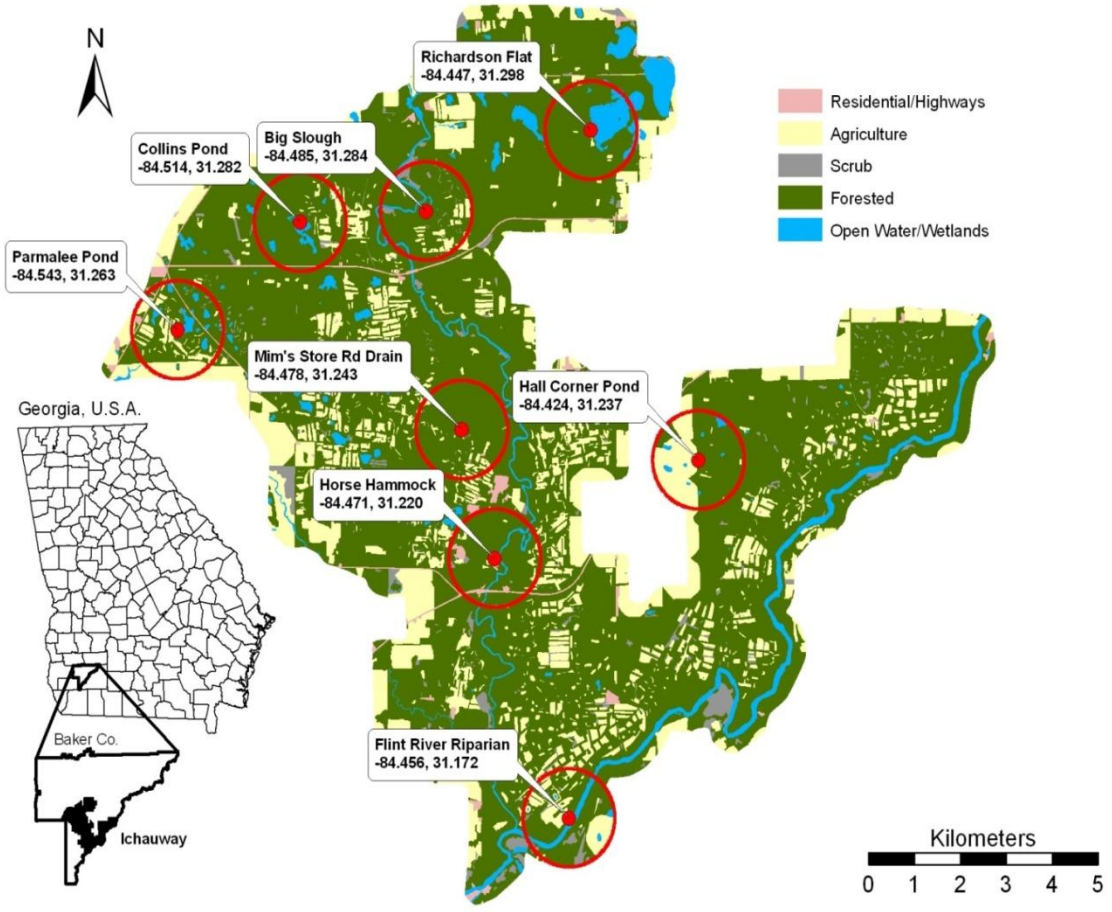
Spatial variation of adult mosquitoes

Methods

- Mosquito collection:
  - CDC CO_2-baited miniature light trap
  - CDC gravid trap

Methods

- Spatial analysis of land surrounding sites
  - 9 land use/ cover categories
    - Pine
    - Hardwood
    - Bottomland hardwood
    - Scrub
    - Forested wetland
    - Non-forested wetland
    - Open water
    - Residential
    - Agriculture



Data Analysis

- Cluster analysis used to compare land use/ cover patterns within 1-km radius of sites
- Indicator species analysis (ISA) performed on weekly mosquito abundance data collected from each site were grouped according to the cluster analysis results
- Species selected:
  - *Ae. albopictus*, *Ae. vexans*, *Cq. perturbans*, *Cx. coronator*, *Cx. erraticus*, *Cx. nigripalpus*, *Cx. quinquefasciatus*, *Cx. restuans*, *Cx. salinarius*, *Oc. triseriatus*, and *Ps. ferox*

Results

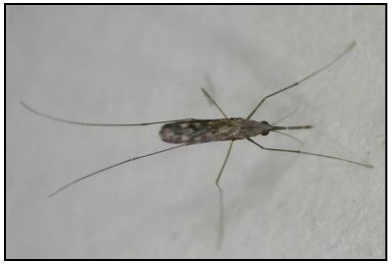
30 Species Collected:

- *Aedes*
  - *albopictus*
  - *vexans*
- *Anopheles*
  - *crucians*
  - *punctipennis*
  - *quadrimaculatus*
- *Coquillettidia*
  - *perturbans*
- *Culiseta*
  - *melanura*
- *Culex*
  - *coronator*
  - *erraticus*
  - *nigripalpus*
  - *quinquefasciatus*
  - *restuans*
  - *salinarius*
  - *territans*
- *Ochlerotatus*
  - *atlanticus*
  - *canadensis*
  - *fulvus pallens*
  - *infirmatus*
  - *mitchellae*
  - *sticticus*
  - *thibaulti*
  - *triseriatus*
- *Orthopodomyia*
  - *signifera*
- *Psorophora*
  - *ciliata*
  - *columbiae*
  - *cyanescens*
  - *ferox*
  - *howardii*
  - *mathesoni*
- *Uranotaenia*
  - *sapphirina*

Ae. vexans

Ps. ferox

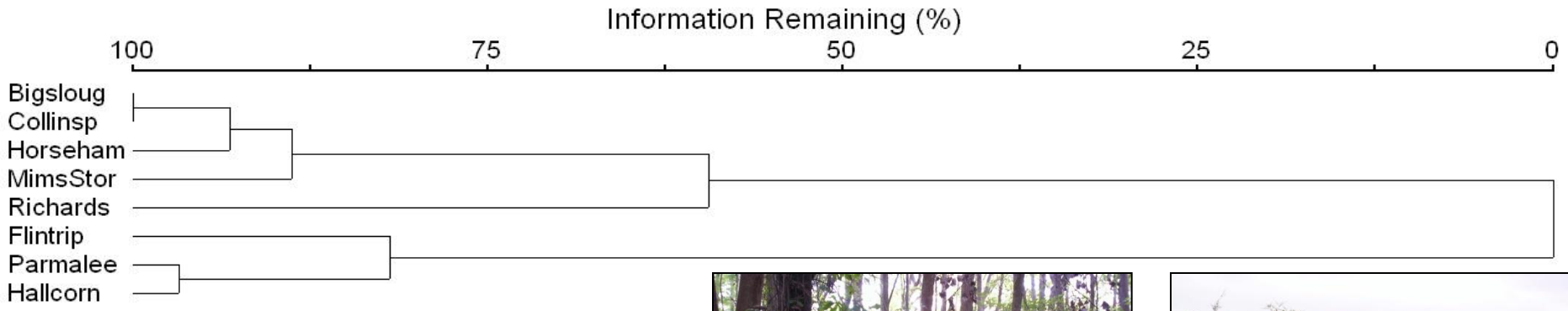
Oc. sticticus



An. crucians

Results

- Cluster analysis



- Big Slough, Collins Pond, and Horse Hammock = Group 1
- Mim's Drain and Richardson Flat = Group 2
- Flint Riparian, Parmalee Pond, Hall Pond = 3

Horse Hammock
Group 1

Richardson Flat
Group 2

Hall Pond
Group 3

Results

- Indicator species analysis

Species	Maxgrp	IV	Mean	S. Dev	P*
Ae. albopictus	2	17.7	12.0	2.36	0.0270*
Ae. vexans	1	35.8	34.2	1.44	0.1270
Cx. coronator	3	17.1	12.2	2.45	0.0484*
Cx. erraticus	3	20.1	16.9	2.67	0.1206
Cx. nigripalpus	2	12.5	12.4	2.43	0.3963
Cx. quinquefasciatus	3	34.7	26.0	2.51	0.0056*
Cx. restuans	2	8.8	10.9	2.47	0.8222
Cx. salinarius	3	28.8	11.4	2.46	0.0002*
Cq. perturbans	2	12.8	5.9	1.88	0.0062*
Oc. triseriatus	2	15.7	13.6	2.54	0.1764
Ps. ferox	1	27.5	12.5	2.59	0.0002*

* Indicates P is significant at 95% level

  - *Ps. ferox* associated with group 1 sites
  - *Ae. albopictus* and *Cq. perturbans* associated with group 2 sites
  - *Cx. coronator*, *Cx. quinquefasciatus*, and *Cx. salinarius* associated with group 3 sites

Conclusions

- *Ps. ferox* ➡ woodland pools

- *Cq. perturbans* ➡ wetland

- *Ae. albopictus* ➡ containers

- *Cx. salinarius* and *Cx. quinquefasciatus* ➡ polluted site and agricultural sites
- *Cx. coronator* ➡ agricultural sites

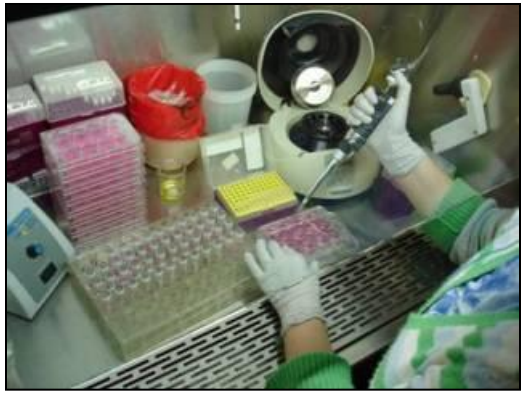
Arbovirus prevalence and host-feeding patterns

Methods

- Mosquito collection
  - CDC CO_2-baited miniature light trap
  - CDC gravid trap
  - Backpack aspirator
- Stored at -80˚C

Methods

- Virus isolation and identification

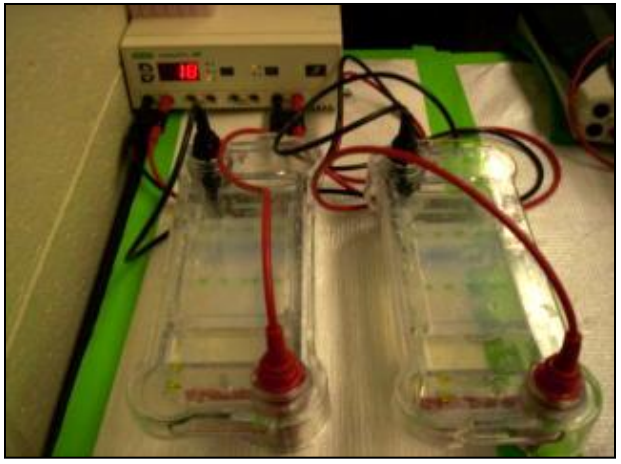


Cell culture inoculation

Observed for 14 days

RNA extraction

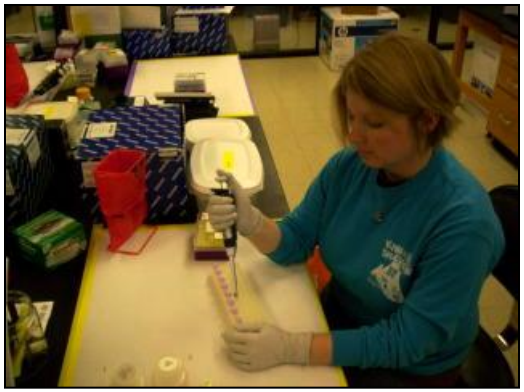
RT-PCR



Gel electrophoresis

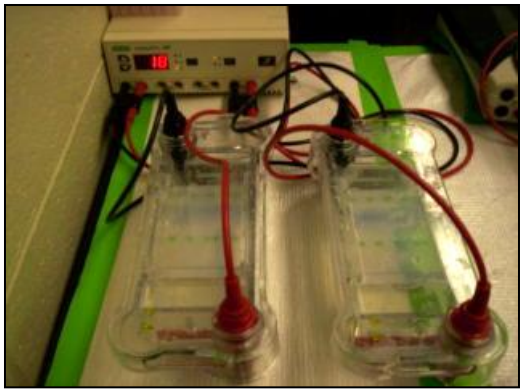
Methods

- Blood meal analysis



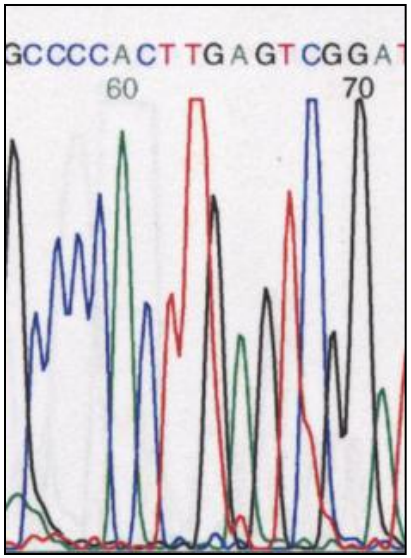
DNA extraction

PCR



Gel electrophoresis

Gel purification



DNA sequencing

Results

Arbovirus prevalence

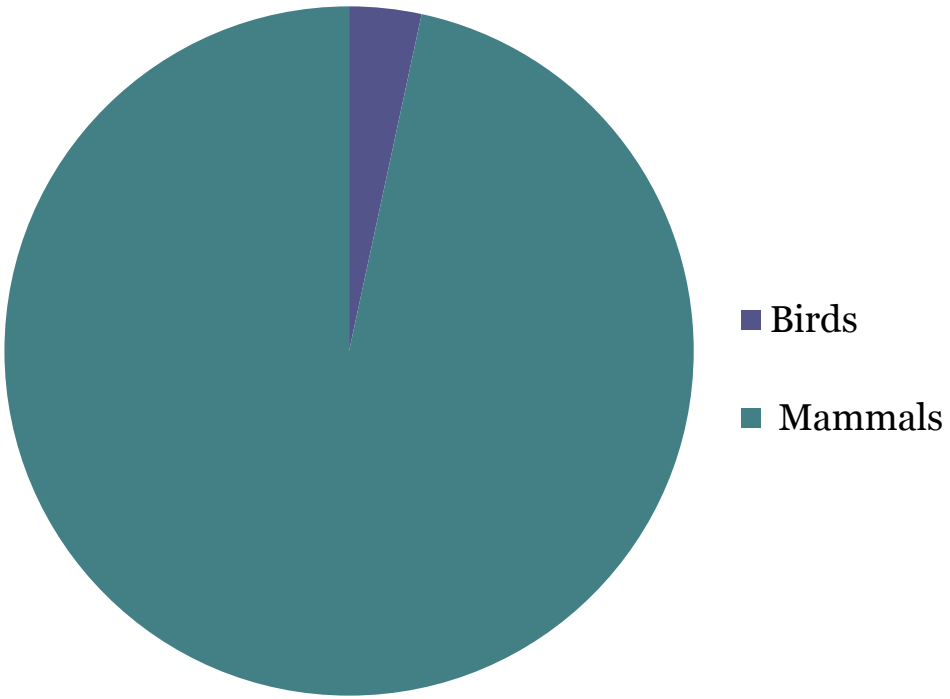
- 987 virus pools
  - 1 pool tested WNV+
  - 3 pools tested POTV+
- West Nile virus (WNV)
  - Minimum Infection Rates
    - *Cx. quinquefasciatus* : 0.87 (95% CI: 0.85- 0.89)
    - All species tested: 0.10 (95% CI: 0.09-0.11)
- Potosi virus (POTV)
  - Minimum Infection Rates
    - *Ae. vexans* : 0.42 (95% CI: 0.41-0.43)
    - *An. punctipennis* : 11.49 (95% CI: 4.79-18.19)
    - All species tested: 0.31 (95% CI: 0.3-0.32)

Results

Host-feeding patterns

- 190 blood-feds collected
- Species majority:
  - *An. quadrimaculatus*
  - *Ae. vexans*
  - *Cx. salinarius*
  - *Ps. ferox*
- 148 hosts identified

Host class results:



Results

- Mammals

Species	Armadillo	Cat	Cow	Deer	Horse	Human	Rabbit	Raccoon	**Total**
Ae. albopictus				1 (100)					1
Ae. vexans		1 (2)	3 (7)	35 (81)	1 (2)	2 (5)	1 (2)		43
An. punctipennis				1 (100)					1
An. quadrimaculatus				81 (100)					81
Cx. coronator							1 (100)		1
Cx. erraticus				2 (100)					2
Cx. restuans				1 (100)					1
Cx. salinarius				8 (100)					8
Ps. ferox	1 (20)			1 (20)		1 (20)	1 (20)	1 (20)	5








Results

- Birds

Species	Cattle egret	Chicken	Northern cardinal	Pigeon	Turkey	**Total**
Ae. vexans					1 (100)	1
An. quadrimaculatus		1 (100)				1
Cx. erraticus	1 (100)					1
Cx. quinquefasciatus			1 (50)	1 (50)		2





Conclusions

- Host-feeding patterns
  - Majority collected fed mammals/ deer
  - Potentially biased by collection techniques
  - No blood meal taken twice from same bird species
- Arbovirus prevalence
  - Overall low
    - Low WNV theories:
      - High bird diversity = dilution effect
      - Time of year when nestling and fledging birds are abundant
  - WNV associated with agriculture and POTV associated with forested land
- Much more research in study area needs to be done!

Acknowledgements

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  - Alan Covich
  - Mark Blackmore
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- **Golladay lab at JWJERC**
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