Southeastern Society of Parasitologists
2011 Program Summary

Meeting Registration/Check In

Wednesday, 6 April 2011, 3:00 – 5:30 p.m.

Location: Unicoi State Park, Unicoi Lodge outside of Master's Hall 4 (3rd floor).

SSP Executive Committee

Wednesday, 6 April 2011, 3:30 – 5:30 p.m.

Location: Unicoi Lodge Board Room

Wednesday, 6 April 2011

SSP Presidential Symposium: 6:00 – 8:20 p.m.
Location: Unicoi Lodge, Master's Hall 4

Parasites: From pathogens to the bizarre to good fellows

Presiding: Isaure de Buron, Department of Biology, College of Charleston.

6:00 p.m. **Introduction and welcoming remarks**

6:05 p.m. **S1. CHERYL D. DAVIS**. Department of Biology, Western Kentucky University, Bowling Green, KY. Parasites as Pathogens

6:50 p.m. **S2. JANICE MOORE**. Department of Biology, Colorado State University, Ft Collins, CO. Parasites and Behavior: the Good, the Bad, and the Bizarre

7:35 p.m. **S3. ARMAND M. KURIS**. Department of Ecology, Evolution and Marine Biology and Marine Science Institute, University of California, Santa Barbara CA. Parasites Approach the Darwinian Demon, Adaptations, Evolutionary Wormholes And Metabolic Scaling.

8:20 pm – Midnight: **SSP Presidental Symposium Speakers Reception and Social**
Location: Beach House

Presentation Loading Session/Slide Preview (the program used will be MS PowerPoint 2003 or newer).
Wednesday Evening during Social.
Location – Unicoi Lodge, Master's Hall 4

Thursday 7 April 2011

7:00 a.m. – 10:30 a.m: Continental breakfast
Location: Atrium (3rd floor next to Master's Hall 4). Hot biscuits with sausage patties, assorted Danish and muffins, seasonal fresh cut fruit, assorted cereals, assorted yogurts, and a wide variety of beverage items.

7:45- 8:05 am: Presentation loading: Unicoi Lodge, Master's Hall 4

Contributed Papers Session I : 8:15 a.m. – 12:00 p.m.
Location – Unicoi Lodge, Master's Hall 4.

***Presenting Author**
†Byrd-Dunn Student Paper Competitor

Presiding:
8:15-10:00 am:
Andrea Varela-Stokes, Mississippi State University
Kim Sonderman, University of Georgia
10:15-noon:
Elizabeth Gleim, University of Georgia
Richard Gerhold, University of Georgia

8:15 † 1 **GLEIM, ELIZABETH*[1,2,3], GALINA E. ZEMSTOVA[4], MIKE CONNER[3], MICHAEL L. LEVIN[4], and MICHAEL J. YABSLEY[1,2].** [1]Warnell School of Forestry and Natural Resources, University of Georgia, Athens, Ga. [2]Southeastern Cooperative Wildlife Disease Study, School of Veterinary Medicine, University of Georgia, Athens, Ga. [3]J.W. Jones Ecological Research Center, Newton, Ga. [4]Centers for Disease Control and Prevention, Atlanta, Ga.30333. Tick seasonality and tick-borne pathogen prevalence in southwest Georgia: providing tools to better determine risk to human public health in a region dominated by prescribed burning.

8:30 † 2 **SHOCK, BARBARA C.*[1,2], SARA COHEN[3], ABELARDO C. MONCAYO[3], MICHAEL J. YABSLEY[1,2].** [1]Southeastern Cooperative Wildlife Disease Study, University of Georgia, Athens, GA. [2]Warnell School of Forestry and Natural Resources, University of Georgia, Athens, GA. [3]Vector-Borne Diseases Section, Communicable and Environmental Diseases, Tennessee Department of Health, Nashville, TN. A potential vector for *Babesia* sp. Coco and the detection of *C. felis* and novel *Babesia* in Ixodid ticks from Tennessee and Kentucky.

8:45 † 3 **RUIZ, CARLOS F.*[1], ERIC R. SALMON[2], CLINT EDDS[3], GEORGE W. BENZ[2], AND STEPHEN A. BULLARD[1].** [1]Department of Fisheries and Allied Aquacultures, Aquatic Parasitology Laboratory, Auburn University, Auburn, AL. [2]Department of Biology, Middle Tennessee State University, Murfreesboro, TN. [3]Louisiana Department of Wildlife and Fisheries, Grand Isle, LA. Parasites as biosensors of the 2010 *Deepwater Horizon* Oil Spill.

9:00 † 4 **HOUK ALICE E. *[1], ALEXA C. ROSYPAL[2], AND DAVID S. LINDSAY[1]**. [1]Virginia Tech, Blacksburg, VA, [2]Johnson C. Smith University, Charlotte, NC. Effects of acid pepsin digestion on the infectivity of a Type I genotype of *Toxoplasma gondii* for human pigmented retinal epithelial cells.

9:15 † 5 **HOLLEY, AMANDA S.*, JENNIFER SPENCER, PATRICIA DEINNOCENTES, JOY L. VAUGHAN, AND BYRON L. BLAGBURN**. Pathobiology Department, Auburn University, Auburn AL. Attempt to isolate *Wolbachia pipientis* from the microfilaria of *Dirofilaria immitis*

9:30 † 6 **O'HEAR, MARY*[1], LINDA POTE[1], D. TOMMY KING[2], CYNTHIA DOFFITT[1], CARLA PANUSKA[1], STEVE MIRANDA[3,], MATT GRIFFIN[4], DAVID WISE[4], SYLVIE QUINIOU[5] AND LESTER KHOO[4]**.[1]Department of Basic Sciences, College of Veterinary Medicine, Mississippi State University, Mississippi State, MS. [2]United States Department of Agriculture/Wildlife Services National Wildlife Research Center, Mississippi State, MS.[3]Department of Wildlife, Fisheries and Aquaculture, Mississippi State University, Mississippi State, MS. [4]Thad Cochran National Warmwater Aquaculture Center, Mississippi State University, Stoneville, MS. [5]Catfish Genetics Research Unit, USDA-ARS, Stoneville, MS. Life histories of the trematodes found in Double-crested Cormorant populations in the Mississippi Delta and the potential impact of these parasites on commercial and wild fish species found in this region.

9:45 † 7 **PULIS, ERIC E.*, STEPHEN S. CURRAN, and ROBIN M. OVERSTREET**. Department of Coastal Sciences, The University of Southern Mississippi, 703 East Beach Drive, Ocean Springs, MS. Evaluation of the classification of some Nearctic and Neotropical Haploporidae based on molecular phylogeny.

10:00-10:15 **BREAK:** Atrium, 3rd floor (next Master's Hall 4)**:** Refreshments provided

10:15 † 8 **SONDERMAN, KIM F.*[1,2], TERRY M. NORTON[3,4], AND MICHAEL J. YABSLEY[1,2]**. [1]Warnell School of Forestry and Natural Resources, University of Georgia, Athens, GA. [2]College of Veterinary Medicine, Southeast Cooperative of Wildlife Disease Study, University of Georgia, Athens, GA. [3]St. Catherine's Island Wildlife Survival Center, Midway, GA. [4]Georgia Sea Turtle Center, Jekyll Island, GA. Haemogregarine infections in a translocated population of gopher tortoises (*Gopherus polyphemus*).

10:30 † 9 **PATEL, JAY[1*], NAMMALWAR SIRIANGANATHAN[1], HEDI NASCIMI[1], KURT ZIMMERMAN[1], W. EDWARD MONROE[1], MICHAEL J. YABSLEY[2], AND DAVID S. LINDSAY[1]**. [1]Virginia Tech, Blacksburg, VA, [2]University of Georgia, Athens, GA. Comparison of the cruzipain and amastigote specific surface protein 4 genes of the Brazil strain of *Trypanosoma cruzi* with a recent dog isolate TcVT-1 from Virginia.

10:45 † 10 **REIN, RACHEL*[1], THOMAS GREIG[2], WAYNE MCFEE[2], ISAURE DE BURON[1], AND STEVE ARNOTT[3].** [1]College of Charleston, Charleston SC, [2]NOAA/NOS, Charleston, SC, [3]SCDNR, Charleston, SC. Identification and distribution of gastric anisakids of pygmy sperm whales (*Kogia breviceps*).

11:00 † 11 **MORARU, GAIL M.*[1], JEROME GODDARD[2], CHRISTOPHER D. PADDOCK[3], AND ANDREA S. VARELA-STOKES[1]**. [1]Department of Basic Sciences, Mississippi State University; [2]Department of Entomology and Plant Pathology, Mississippi State University; [3]Division of Viral and Rickettsial Diseases, Centers for Disease Control and Prevention, Atlanta, Georgia. *Rickettsia parkeri* infection in cotton rats and bobwhite quail.

11:15 † 12 **CHARLES, ROXANNE A.*[1], SONIA A. KJOS[2], ANGELA E. ELLIS[3], MICHAEL J. YABSLEY[1,4]**. [1]Southeastern Cooperative Wildlife Disease Study, University of Georgia, Athens, GA. [2]Centers for Disease Control and Prevention, Atlanta, GA and currently at Marshfield Clinic Research Foundation, Marshfield, WI, [3]Athens Diagnostic Laboratory, College of Veterinary Medicine, University of Georgia, Athens, GA, [4]Warnell School of Forestry and Natural Resources, University of Georgia, Athens, GA. Comparison of the prevalence of *Trypanosoma cruzi* between southern plains woodrats (*Neotoma micropus*) and other known reservoirs from Uvalde County, Texas.

11:30 † 13 **COX, STEPHANIE J.*[1], COVA R. ARIAS[2], AND STEPHEN A. BULLARD[1]**. [1]Department of Fisheries and Allied Aquacultures, Aquatic Parasitology Laboratory, Auburn University, Auburn, AL. [2]Aquatic Microbiology Laboratory, Auburn University, Auburn, AL. An unexpected trematode infection casts doubt on claim of "laboratory-reared" experimental zebrafish, *Danio rerio*.

11:45 † 14 **WHITNEY M. KISTLER*[1,2], MICHAEL J. YABSLEY[1,2], TODD M. JOHNSON[1], SARAH ARNOLD[1], AND SONIA HERNANDEZ[1,2].** [1]Warnell School of Forestry and Natural Resources, University of Georgia, Athens, GA, [2]Southeastern Cooperative Wildlife Disease Study, University of Georgia, Athens, GA. Comparison of two detection methods of *Heamoproteus* in wild birds from Costa Rica.

12:00 – 1:45 p.m.: Lunch Break (on your own)

Location: Unicoi Lodge Restaurant or Helen (the alpine city of) is about 4 miles away and offers a wide range of German-style options.

1:15-1:35 pm: Presentation loading (Master's Hall 4)

Contributed Papers Session II: 1:45 p.m. – 5:15 p.m.
Location – Master's Hall 4

Presiding:
1:45-3:30 pm:
Roxanne Charles, University of Georgia
Jen Hein, College of Charleston
3:45-5:15 pm
Mary O'Hear, Mississippi State University
Paul Cosmann, College of Charleston

1:45 † 15 **UMBERGER, CARRIE M.* [1], ERIC J. MCELROY[1], ISAURE DE BURON[1], AND WILLIAM A. ROUMILLAT[2]**. [1]College of Charleston, Charleston, SC. [2]MRRI, Department of Natural Resources, Charleston, SC. Effects of the parasitic nematode, *Philometroides paralichthydis*, on the swimming and burying performance of the southern flounder, *Paralichthys lethostigma*.

2:00 † 16 **UNDERHILL, CASEY*, AND CHRIS HALL**. Department of Biology, Berry College GA. The role of host-mediated phagocytosis in *Trypanosoma cruzi* invasion of placental trophoblast cells

2:15 † 17 **GIRAO, FLAVIA A.*[1], JEROME GODDARD[2], CHRISTOPHER PADDOCK[3], AND ANDREA VARELA-STOKES[1]**. [1]College of Veterinary Medicine, Mississippi State University, Mississippi State MS, [2]Department of Entomology and Plant Pathology, Mississippi State University, Mississippi State MS, [3]Infectious Diseases Pathology Branch, Centers for Disease Control and Prevention, Atlanta GA. Prevalence and ultrastructure of "*Candidatus* Rickettsia andeanae" in the Gulf Coast tick, vector of the human pathogen, *Rickettsia parkeri*.

2:30 † 18 **TRUONG, TRIET N.* AND STEPHEN A. BULLARD**. Department of Fisheries and Allied Aquacultures, Aquatic Parasitology Laboratory, Auburn University, Auburn, AL. Comparative study on the parasite biodiversity of channel catfish (*Ictalurus punctatus*), blue catfish (*Ictalurus furcatus*), and hybrid catfish (female *Ictalurus punctatus* × male *Ictalurus furcatus*) in small pond aquaculture.

2:45 † 19 **EDWARDS, JESSICA F. [*1], DAWN M. ROELLIG[2], AND MICHAEL J. YABSLEY [1,3]**. [1]Department of Population Health, College of Veterinary Medicine, The University of Georgia, Athens GA. [2]Division of Parasitic Diseases and Malaria, Center for Global Health, Center for Disease Control and Prevention, Atlanta GA. [3]D.B. Warnell School of Forestry and Natural Resources, The University of Georgia, Athens GA. United States *T. cruzi* elicits a weaker pro-inflammatory immune response in mice than South American *T. cruzi*.

3:00 † 20 **GONYNOR-MCGUIRE, JESSICA*, ELIZABETH MILLER, AND MICHAEL J. YABSLEY**. Warnell School of Forestry and Natural Resources and the Southeastern Cooperative Wildlife Disease Study, University of Georgia, Athens, GA. Parasites of gopher tortoises (*Gopherus polyphemus*) in Georgia.

3:15 † 21 **FAYTON, THOMAS*, OVERSTREET, ROBIN, AND HEARD, RICHARD.W**. Gulf Coast Research Laboratory, The University of Southern Mississippi, Ocean Springs, MS. Digenean parasites of a Florida Spring.

3:30-3:45 **BREAK:** Atrium, 3rd floor (next Master's Hall 4)**: Refreshments provided.**

3:45 † 22 **PURDEE, MICHAELLE*[1], BARBARA SHOCK[1,2], NOLA PARSON[3], ELIAZABETH HORNE[4], TRUDI MALAN[4], CLAIRE RICE[1], AND MICHAEL J. YABSLEY[1,2]**. [1]Southeastern Cooperative Wildlife Disease Study, Department of Population Health, College of Veterinary Medicine, The University of Georgia, Athens, GA. [2]Warnell School of Forestry and Natural Resources, The University of Georgia, Athens, GA. [3]Southern African Foundation for the Conservation of Coastal Birds (SANCCOB), Cape Town, South Africa. [4]Penguins Eastern Cape, Cape St. Francis, South Africa. Hemoparasites in African penguins (*Spheniscus demersus)* and other South African marine birds.

4:00 23 **PALMIERI, JAMES R.[1], SHAADI F. ELSWAIFI[1], DAVID S. LINDSAY[2], GRETCHEN JUNKO*[1], AND CATHY CALLAHAN[1]**. [1]Department of Microbiology, Infectious, and Emerging Diseases, Edward Via College of Osteopathic Medicine. [2]Department Biomedical Sciences and Pathobiology, Virginia Maryland Regional College of Veterinary Medicine. Case Report: Chronic Microsporidial Enteritis in a Missionary from Mozambique.

4:15 24 **MCELWAIN, ANDREW*[1], STACEY A. LAFRENTZ[2], COVADONGA R. ARIAS[2], AND STEPHEN A. BULLARD[1]**. [1]Aquatic Parasitology Laboratory, Department of Fisheries and Allied Aquacultures, Auburn University, Auburn, AL, [2]Aquatic Microbiology Laboratory, Auburn University. A Unionid Histological Atlas.

4:30 25 **FRIED, KAREN*, JAMES R. PALMIERI, SHAADI F. ELSWAIFI, AND ARBEN SANTO**. Department of Microbiology, Infectious, and Emerging Diseases, Edward Via College of Osteopathic Medicine. A Misdiagnosed Case of Paragonimiasis in a Patient with Multiple Sclerosis.

4:45 26 **KANSAS SPARKS,[1] MATTHEW TUCKER,[1] FRANCOIS NOSTEN,[2] AND DENNIS E. KYLE[1].** [1]University of South Florida College of Public Health; [2]Shoklo Malaria Research Unit. Defining the Elusive In Vitro Artemisinin Resistance Phenotype of *Plasmodium falciparum*

5:00 27 **ELSWAIFI, SHAADI F.*, JAMES R. PALMIERI, CATHERINE MINICHINO, AND GENEVA GEHRING**. Department of Microbiology, Infectious, and Emerging Diseases, Edward Via College of Osteopathic Medicine. Uptake of Nanoparticles of Cerium Oxide and Yttrium Oxide by *Acanthamoeba castellanii* (Protozoa) and *Daphnia magna* (Crustacea).

5:15-5:20 **Dr. Armand Kuris: update as president-elect of the American Society of Parasitologists**

6:00-midnight **BBQ Dinner and other activities, Beach House**

Friday 7 April 2011

Breakfast
On your own, Unicoi Lodge Restaurant

7:45- 8:05: Presentation Loading (Master's Hall 4)

Contributed Papers Session III: 8:15 a.m. – 12:00 p.m.
Location – Unicoi Lodge, Master's Hall 4
*Presenting Author

Presiding:
8:15-10:00 am:
Barbara Shock, University of Georgia
Kansas Sparks, University of South Florida
10:15-noon:
Flavia Girao, Mississippi State University
Amanda Hott, University of South Florida

8:15 28 **HOTT, AMANDA M.*, MATTHEW TUCKER, AND DENNIS E. KYLE.** Department of Global Health, College of Public Health, University of South Florida, Tampa FL. Characterization of artelinic and artemisinin resistant *Plasmodium falciparum*.

8:30 29 **HICKLING, GRAHAM J.*[1], JESSICA R. HARMON[1,2], M. CATHY SCOTT[1], AND CARL J. JONES[2].** [1]Center for Wildlife Health and [2]Department of Entomology and Plant Protection, University of Tennessee Institute of Agriculture, Knoxville TN. Emergence of tick-borne disease in a Tennessee 'exurban' community.

8:45 30 **OSCAR J. PUNG*[1], KYLE N. ROBERTSON[1], TERRY LESTER, JR.[1], AND BRIAN LUND FREDENSBORG[2].** [1]Department of Biology, Georgia Southern University, Statesboro, GA. [2]Department of Biology, University of Texas-Pan American, Edinburg, TX. The parasite or the protocol: In vitro fertilization and reproduction of *Probolocoryphe lanceolata* (Trematoda: Microphallidae) in a culture system developed for the trematode *Microphallus turgidus*.

9:00 31 **VARELA-STOKES, ANDREAS.*[1], FLOYD D. WILSON[2], DANA AMBROSE[3], ALYSSA SULLIVANT[4], AND G.J. VAN DAM[5].** [1]College of Veterinary Medicine, Mississippi State University, Starkville, MS. [2]Mississippi State Research & Diagnostic Laboratory, Mississippi State University, Pearl, MS. [3]College of Veterinary Medicine, University of Georgia, GA. [4]Desoto County Animal Clinic, Southaven, MS, [5]Department of Parasitology, Leiden University Medical Center, Leiden, The Netherlands. *Heterobilharzia americana* in a Mississippi dog: Are we underdiagnosing this?

9:15 32 **CURRAN, STEPHEN, S., AND ROBIN M. OVERSTREET**. Department of Coastal Sciences, The University of Southern Mississippi, Ocean Springs, MS. Changes in the parasite fauna of the Atlantic croaker, *Micropogonias undulatus*, from coastal waters impacted by the Deepwater Horizon oil spill.

9:30 33 **POWELL, MALCOLM R**. Department of Biology, Western Carolina University, Cullowhee, NC. Chagas disease in the Americas.

9:45 34 **PALMIERI, JAMES R.* AND SHAADI F. ELSWAIFI**. Department of Microbiology, Infectious, and Emerging Diseases, Edward Via College of Osteopathic Medicine. Emerging need for parasitology education: Training to identify and diagnose parasitic infections.

10:00–10:15 **BREAK Atrium, 3rd floor (next Master's Hall 4): Refreshments provided**

10:15 35 **GERHOLD, RICHARD*[1,2], LARRY MCDOUGALD[1], ROBERT BECKSTEAD[1], AND KATE HAYDEN[3]**. [1]Poultry Science Department, University of Georgia, Athens GA. [2]The Center for Wildlife Health, Department of Forestry, Wildlife, and Fisheries, The University of Tennessee, Knoxville, TN. [3]Kentucky Department of Fish and Wildlife Resources, Frankfort, KY. Detection and epidemiology of *Trichomonas gallinae* in Peregrine falcon nestlings in Kentucky.

10:30 36 **BULLARD STEPHEN A.** Department of Fisheries and Allied Aquacultures, Aquatic Parasitology Laboratory, Auburn University, Auburn, AL. Revisionary systematics and coevolution of blood flukes infecting non-tetrapod craniates.

10:45 37 **TEIXEIRA, MARIA A. *[1,2], PATRICIA L. DORN[3], DAWN M. ROELLIG[4], STEPHEN A. KLOTZ[5], JUSTIN O. SCHMIDT[6], AND MICHAEL J. YABSLEY MJ[2,7]**. [1] Federal University of Mato Grosso do Sul, Campo Grande, MS, Brazil; [2] Southeastern Cooperative Wildlife Disease Study, Department of Population Health, College of Veterinary Medicine, The University of Georgia, Athens, GA, USA; Loyola University New Orleans, New Orleans, LA, USA, [4]Centers for Disease Control and Prevention, Atlanta, GA, USA; [5]Section of Infectious Diseases, University of Arizona, Tucson, AZ, USA; [6]Southwestern Biological Institute, Tucson, AZ, USA; and [7]D.B. Warnell School of Forestry and Natural Resources, The University of Georgia, Athens, GA, USA. Genetic similarity among *Trypanosoma cruzi* from diverse sources and geographical regions of the United States.

11:00 38 **DOVE ALISTAIR D.M. *[1], TONYA CLAUSS[1], DAVID MARANCIK[2] AND ALVIN CAMUS[2].** [1]Correll Center for Aquatic Animal Health, Georgia Aquarium. 225 Baker St., Atlanta GA 30313; [2]College of Veterinary Medicine, University of Georgia, Athens GA. The leech *Branchellion torpedinis*: a significant pathogen of demersal elasmobranchs in a large aquarium.

11:15 39 **RIPLEY, ALLYSON[1], HEATHER D. STOCKDALE[2], DAVID C. GRANT[1], BYRON L. BLAGBURN[3], AND DAVID S. LINDSAY*[1].** [1]Virginia Tech, Blacksburg, VA, [2]University of Florida, Gainesville, FL, 3Auburn University, Auburn, Al. Survival of a feline isolate of *Tritrichomonas foetus* in the environment.

11:30 40 **FAULKNER, CHARLES*, SARAH DECKER, ALY CHAPMAN, AARON BAUMANN, AND SHARON PATTON**. University of Tennessee College of Veterinary Medicine, Knoxville TN. Comparison of Fecal Flotation Methods for Detection of Endoparasitic Infections in Dogs.

11:45 41 **ZELMER, DEREK A**. Department of Biology and Geology, University of South Carolina Aiken, Aiken, SC. Ecological drift in parasite infracommunities.

12:00 Noon: SSP Business Meeting and Lunch

Location: Smith Creek Room, 3rd floor Unicoi State Park Lodge next to Atrium.

SSP 2011 PROGRAM ABSTRACTS

S1. **DAVIS, CHERYL D.** Department of Biology, Western Kentucky University, Bowling Green, KY. Parasites as Pathogens.

Due to the enormity of the subject of parasitic pathogens, these remarks will be focused on the parasites that are pathogenic in humans. The field of human parasitology has surprisingly ancient origins. Undoubtedly, even primitive humans were aware of the largest and most common parasitic worms and arthropods and at least some of the diseases they caused. The Ebers papyrus (1550 BC), considered by many authors to be among the oldest written accounts of human parasites, makes reference to at least four helminths as well as parasitic arthropods such as fleas, flies, and lice. Linnaeus (1707-1798) described and named six helminths. The parasitic protozoa were the last to be discovered, although van Leeuwenhoek is credited with describing the first human parasitic protozoon (*Giardia lamblia*) in 1681. Trypanosomes, parasitic amoebae, and malarial parasites were not described until the 19th century. Despite the impressive advances made in our understanding of the immunological, biochemical, and molecular aspects of host-parasite relationships in the 20th century and the early part of the 21st century, to date there are still no immediate prospects for a vaccine against any human parasitic pathogen. It is a challenging and promising time for the discipline of human parasitology. Global climate change predictions suggest that far-ranging effects are occurring in the distributions and population dynamics of parasitic pathogens, provoking fears of widespread increases in disease incidence. However, there are also unprecedented global efforts currently underway that are focused on the control or elimination of the major "neglected tropical diseases" of humans.

S2. **MOORE, JANICE**. Department of Biology, Colorado State University, Ft Collins, CO. Parasites and Behavior: the Good, the Bad, and the Bizarre.

Parasitized animals do not behave like unparasitized conspecifics. As study after study reveals, this seems to be as nearly ubiquitous as any biological observation can be. The ways in which parasitized animals behave differently—and why they do so, both in proximate and ultimate terms—are a bit more nuanced than biologists originally thought. This is largely because the interests of parasite and host coincide in some associations and diverge in others, coincide at some times during the life cycles of the participants, and diverge at others. This talk will provide an overview of the conflicting (and coinciding) demands on parasite and host, using examples from a wide range of taxa and posing questions for the future.

S3. **KURIS, ARMAND M.** Department of Ecology, Evolution and Marine Biology and Marine Science Institute, University of California, Santa Barbara CA. Parasites Approach the Darwinian Demon, Adaptations, Evolutionary Wormholes and Metabolic Scaling.

The basis for life history theory is that resources are limited. Organisms must trade off basic fitness traits associated with reproduction, growth and longevity. A Darwinian Demon is a hypothetical creature living in an unlimited world, so it does not require tradeoffs, reproducing and growing at maximum rates and potentially living forever. Parasitism appears to be evolution towards the Darwinian Demon. But, evolution to an infectious trophic strategy appears to be a rare event. However, unlike other specializations, parasitic clades are stable, long lasting, and often evolve spectacular species-rich radiations. At the ecosystem level neither the density of parasites nor their trophic levels scale with body size as they do for other organisms. Including parasites in these analyses increases the degree of evolutionary and ecological generality.

1. **GLEIM, ELIZABETH*[1,2,3], GALINA E. ZEMSTOVA[4], MIKE CONNER[3], MICHAEL L. LEVIN[4], AND MICHAEL J. YABSLEY[1,2]**. [1]Warnell School of Forestry and Natural Resources, University of Georgia, Athens, Ga. [2]Southeastern Cooperative Wildlife Disease Study, School of Veterinary Medicine, University of Georgia, Athens, Ga. [3]J.W. Jones Ecological Research Center, Newton, Ga. [4]Centers for Disease Control and Prevention, Atlanta, Ga. Tick seasonality and tick-borne pathogen prevalence in southwest Georgia: providing tools to better determine risk to human public health in a region dominated by prescribed burning.

The importance of understanding tick species composition, seasonality, and pathogen prevalence has been underscored recently by increases in incidences of tick-borne diseases. In this study, ticks are being collected and tested for pathogens from 21 sites in southwestern Georgia with different prescribed burning regimes. During 2010, a total of 32,518 ticks

were collected including 347 *Amblyomma americanum* adults, 1,517 *Amblyomma* sp. nymphs, 30,273 *Amblyomma* sp. larvae, 170 adult *A. maculatum*, 69 adult *Dermacentor variabilis*, and 130 adult *Ixodes* sp. Adult *A. americanum* peaked in June and September and *Amblyomma* sp. nymphs and larvae peaked in June and July-September, respectively. Adults of *A. maculatum* peaked between June to August and *D. variabilis* peaked in July. Finally, *Ixodes* sp. adults peaked in November and March. Of ticks tested to date, *Ehrlichia chaffeensis* and *E. ewingii* were found in 0.4% and 1.3%, respectively, of adult *A. americanum* (n=228). The minimum infection rate of *E. chaffeensis* (n=596, 107 pools) in *Amblyomma* sp. nymphs was 0.3%. *Rickettsia* spp. were common among all species (54% in *A. americanum*, 20% in *A. maculatum* (n=60), and 19% in *D. variabilis* (n=21). *Borrelia lonestari* was detected in 1.3 and 1.6% of adult and nymphal *Amblyomma* sp., respectively. Significant differences in tick species diversity were noted between different burning regimes. Although there was no difference in prevalence of tick-associated organisms by burning regime, the overall decrease in some tick species in burned areas indicates potentially lower risk of human tick-borne disease risk due to lower encounter risk.

2. SHOCK, BARBARA C.*[1,2], SARA COHEN[3], ABELARDO C. MONCAYO[3], AND MICHAEL J. YABSLEY[1,2]. [1]Southeastern Cooperative Wildlife Disease Study, University of Georgia, Athens, GA. [2]Warnell School of Forestry and Natural Resources, University of Georgia, Athens, GA. [3]Vector-Borne Diseases Section, Communicable and Environmental Diseases, Tennessee Department of Health, Nashville, TN. A potential vector for *Babesia* sp. Coco and the detection of *C. felis* and novel *Babesia* in Ixodid ticks from Tennessee and Kentucky.

The piroplasms are tick-transmitted protozoan parasites in the genera *Babesia*, *Theileria*, and *Cytauxzoon*. The incidence and diversity of piroplasms are increasing in North American humans and wild and domestic animals. For example, in 2009, a novel *Babesia* sp. was detected in a man from TN, and at least 9 *Babesia* spp. have been reported in domestic dogs from the US. For many of these emerging piroplasms, the vector is unknown but presumed to be an Ixodid tick. In this study, a piroplasm-specific PCR was used to screen 169 and 58 *Amblyomma americanum* and 442 and 21 *Dermacentor variabilis* from TN and KY, respectively. Of the 690 ticks, 67 (10%) were PCR positive for *Theileria*, *Babesia*, or *Cytauxzoon*. In KY, 12 (21%) *A. americanum* were positive, but no *D. variabilis* were positive. In TN, 24 (14%) *A. americanum* and 31 (7%) *D. variabilis* were positive, respectively. Because some amplicons are similar in size, sequencing is required for specific identification. Although some sequencing is pending, thus far, 4 (0.9%) *D. variabilis* from TN were positive for *C. felis*. Other interesting findings include three questing *A. americanum* infected with *Babesia* spp. which is the first report of *Babesia* infection of *Amblyomma* in the United States. Two *A. americanum* were infected with *Babesia* sp. Coco, a *Babesia* previously only detected in immunocompromised dogs, for which no vector or reservoir is known. These data highlight the importance of screening vectors for potential pathogens.

3. RUIZ, CARLOS F.*[1], ERIC R. SALMON[2], CLINT EDDS[3], GEORGE W. BENZ[2], AND STEPHEN A. BULLARD[1]. [1]Department of Fisheries and Allied Aquacultures, Aquatic Parasitology Laboratory, Auburn University, Auburn, AL. [2]Department of Biology, Middle Tennessee State University, Murfreesboro, TN. [3]Louisiana Department of Wildlife and Fisheries, Grand Isle, LA. Parasites as biosensors of the 2010 *Deepwater Horizon* Oil Spill.

Shifts in parasite diversity, prevalence, and intensity resulting from the 2010 BP *Deepwater Horizon* Oil Spill (DHOS) could indicate spill-related changes to water quality, abundances of free-living organisms, and estuarine food webs. Ectoparasites (direct life cycles, no food-web mediated transmission) may be indicators of acute spill effects because they are typically small, have high surface area to volume ratios, and remain immersed in seawater. Endoparasites (indirect life cycles, food-web mediated transmission) may be indicators of chronic spill effects because they infect internal sites in their hosts, which hypothetically makes them less vulnerable to toxins, and they require predator/prey transmission. In this ongoing study, we compare parasite biodiversity in the Gulf killifish, *Fundulus grandis*, (Fundulidae: Cyprinidontiformes) among four oiled and four non-oiled estuarine sites (1.5-10 km apart) in southern Louisiana and across four sampling periods (spanning 2-4 days and all four within 1 yr of the DHOS). One-hundred killifish were captured at each collection site using baited minnow traps, abdominally-injected with neutral buffered formalin after field euthanasia, and individually immersed in formalin-filled bags for subsequent necropsy. Additional killifish were field-necropsied to photograph and collect living parasites that were heat-killed and/or formalin-fixed for species identification or placed directly in DNA buffer for sequencing. In the laboratory, the skin, fins, eyes, gill, stomach, intestine, mesentery, liver,

spleen, kidney, body cavity, somatic musculature, and brain were examined for metazoan parasites with aid of dissecting and compound microscopy. Tissue sub-samples were processed routinely for histopathology. Supported by NSF RAPID grant DEB-1048523.

4. **HOUK, ALICE E.*[1], ALEXA C. ROSYPAL[2], AND DAVID S. LINDSAY[1]**. [1]Virginia Tech, Blacksburg, VA, [2]Johnson C. Smith University, Charlotte NC. Effects of acid pepsin digestion on the infectivity of a Type I genotype of *Toxoplasma gondii* for human pigmented retinal epithelial cells.

Toxoplasma gondii is a zoonotic parasite. It has a complex life cycle that uses cats as the definitive host and warm-blooded animals as intermediate hosts. There are 3 major genotypes that compose 95% of the isolates from North America and Europe. The other 5% are considered atypical. We are interested in the biology of the bradyzoite stage of *T. gondii* that occurs in latent tissue cysts. Bradyzoites differ biologically and ultrastructurally from sporozoites and tachyzoites. They are the only stage that can induce oocyst production (bradyzoite to schizogony stage conversion) in cats. They also are responsible for initiating oral infections (bradyzoite to tachyzoite stage conversion) in carnivores. The tissue cyst stage is responsible for reactivated toxoplasmosis that occurs in the eyes of immunocompetent individuals and encephalitis in immunocompromised individuals. Bradyzoites are generally considered resistance to acid-pepsin (AP) solution because they are orally infectious. We hypothesized that the TS-4 mutant strain of *T. gondii*, which is tissue cyst-less, would be highly sensitive to AP solution when compared to its parent RH strain (Type I genotype). We used human pigmented retinal epithelial cells, our clone of the RH strain ARH-2, and the TS-4 strain of *T. gondii* to examine our hypothesis. We found that the longest exposure times at which organisms remained infectious were 1 hour for the ARH-2 strain and 45 minutes for the TS-4 strain. These initial finding disagree with our original hypothesis. We are continuing this line of examination and will present updated results.

5. **HOLLEY, AMANDA S.*, JENNIFER SPENCER, PATRICIA DEINNOCENTES, JOY L. VAUGHAN, AND BYRON L. BLAGBURN**. Pathobiology Department, Auburn University, Auburn AL. Attempt to isolate *Wolbachia pipientis* from the microfilaria of *Dirofilaria immitis*.

Wolbachia is a genus of obligate intracellular gram negative bacteria found within many arthropods and nematodes. Currently, *Wolbachia pipientis* is the only identified species. One filarial host of *Wolbachia* is *Dirofilaria immitis*, the causative agent of heartworm disease in dogs, cats, and other hosts. *Wolbachia* and *D. immitis* share a mutualistic relationship, whereby each provides survival benefits to the other. Treatment of canine heartworm disease often leads to inflammatory lung disease. Evidence indicates that *Wolbachia* may contribute to pulmonary inflammation caused by heartworms both before and after treatment. Research that has been conducted on the immune response to *Wolbachia* utilized recombinant *Wolbachia* surface protein (rWSP), since nematode derived *Wolbachia* has not yet been cultured. As rWSP does not include all possible antigens of *Wolbachia*, the effects of *Wolbachia* on the immune system of hosts of *D. immitis* are not completely understood. There exists little published research that focuses on isolation of *Wolbachia* from nematodes, a needed step in establishing a culture. In an attempt to isolate *Wolbachia* from the microfilaria of *D. immitis*, we utilized a saponin/centrifugation procedure to purify microfilaria from blood. To capture *Wolbachia*, microfilaria were shaken and spun in a 30% percoll gradient. However, isolation of *Wolbachia* was unsuccessful. Additional work is necessary to isolate and culture nematode derived *Wolbachia.* Given our failure to isolate *W. pipientis,* future research will focus on exposing canine lymphocytes from heartworm positive and negative dogs to rWSP to determine rWSP-induced cytokine responses.

6. **O'HEAR, MARY*[1], LINDA POTE[1], D. TOMMY KING[2], CYNTHIA DOFFITT[1], CARLA PANUSKA[1], STEVE MIRANDA[3], MATT GRIFFIN[4], DAVID WISE[4], SYLVIE QUINIOU[5] ANDLESTER KHOO[4]**. [1]Department of Basic Sciences, College of Veterinary Medicine, Mississippi State University, Mississippi State, MS. [2]United States Department of Agriculture/Wildlife Services National Wildlife Research Center, Mississippi State, MS.[3]Department of Wildlife, Fisheries and Aquaculture, Mississippi State University, Mississippi State, MS. [4]Thad Cochran National Warmwater Aquaculture Center, Mississippi State University, Stoneville, MS. [5]Catfish Genetics Research Unit, USDA-ARS, Stoneville, MS. Life histories of the trematodes found in Double-crested Cormorant populations in the Mississippi Delta and the potential impact of these parasites on commercial and wild fish species found in this region.

The population of Double-crested Cormorants (*Phalacrocorax auritus*) has steadily increased in the Mississippi Delta. This piscivorous bird serves as a definitive host for numerous trematodes, many of which have immature stages that infect numerous fish species. The goal of this study is to identify and determine the impact of these trematodes on both commercial and wild fish populations in the Mississippi Delta. All adult trematodes were enumerated and identified from cormorants (35) collected in close proximity to commercial catfish ponds in the Mississippi Delta. The trematodes *Austrodiplostomum ostrowskiae, Hysteromorpha triloba, Drepanocephalus spathans* and *Ascotyle longus* were recovered from the cormorants and are reported to have fish as an intermediate host. Recent DNA sequencing results have linked the adult *Drepanocephalus* found in the cormorant to a metacariae that induces pathology in catfish. Significant numbers of *Pseudopsilostoma varium* were also found in the cormorants, but the life cycle of this parasite is unknown. In addition, fish were collected from an ox-bow lake located near commercial catfish operations which had a large resident cormorant population. Fish were examined externally and internally for the presence of parasites. A large percentage of these fish were infected with *Posthodiplostomum minimum*, which was found in multiple organs in 6 fish species. *P. minimum* was the only larval trematode stage recovered from this fish population. Research is underway to identify the hosts for *P. minimum* in this lake and identify the life stages of *Pseudopsilostoma varium* using molecular sequence comparisons. Research was partially supported by the Berryman Institute.

7. **PULIS, ERIC E.*, STEPHEN S. CURRAN, AND ROBIN M. OVERSTREET**. Department of Coastal Sciences, The University of Southern Mississippi, 703 East Beach Drive, Ocean Springs, MS. Evaluation of the classification of some Nearctic and Neotropical Haploporidae based on molecular phylogeny.

Trematodes of the family Haploporidae, subfamily Chalcinotrematinae, as currently recognized, are represented by the genera *Chalcinotrema*, *Paralecithobotrys*, *Megacoelium*, *Saccocoelioides*, and *Unicoelium*, from fresh-water and brackish-water fish from South American, North America as far north as Texas, and one species from Africa. Overstreet and Curran proposed Chalcinotrematinae to accommodate these genera united by morphological features, biogeography, and host specificity not involving mugillid hosts as occurs in Haploporinae and Waretrematinae. Systematic revision of this subfamily has been impeded because of inconsistent fixation techniques and lack of molecular data. The present study is an attempt to estimate the interrelationships among genera in the Haploporidae using maximum likelihood and Bayesian inference analyses of sequences of 28S ribosomal DNA. Sequences were obtained from freshly collected haploporid specimens and from data in GenBank. We collected fresh specimens of three species of *Saccocoelioides* plus a variety of haploporids belonging outside the Chalcinotrematinae *sensu stricto* for building a molecular phylogeny for estimating the interrelationships among genera in the family. Our results suggest that 1) *Saccocoelioides* is not a natural group, 2) the type species for *Saccocoelioides*, *S. nanii*, is closely related to species presently belonging in *Culuwiya*, but some other species in *Saccocoelioides* are more distantly related to *S. nanii*, 3) species previously housed in *Culuwiya* belong in Chalcinotrematinae rather than Waretrematinae, 4) *Culuwiya* may be junior synonym of *Saccocoelioides*, and (5) a new genus for some species in *Saccocoelioides* may need to be erected in the future. This work was supported by NSF grant number 0529684.

8. **SONDERMAN, KIM F.*[1,2], TERRY M. NORTON[3,4], AND MICHAEL J. YABSLEY[1,2].** [1]Warnell School of Forestry and Natural Resources, University of Georgia, Athens, GA. [2]College of Veterinary Medicine, Southeast Cooperative of Wildlife Disease Study, University of Georgia, Athens, GA. [3]St. Catherine's Island Wildlife Survival Center, Midway, GA. [4]Georgia Sea Turtle Center, Jekyll Island, GA. Haemogregarine infections in a translocated population of gopher tortoises (*Gopherus polyphemus*).

Hemogregarines, apicomplexan intraerythrocyte parasites, are common in amphibians and reptiles, especially aquatic turtles. To date only a few species have been reported from tortoises and little is known about their life cycles. Recently, an undescribed haemogregarine was reported from gopher tortoises (*Gopherus polyphemus*). We have initiated at study to better understand this parasite, including morphologic characteristics, vector(s), and effect on host. In the current project, we are concentrating on a translocated population of gopher tortoises on St. Catherine's Island, Georgia (USA). Based on preliminary data, 75% of tortoises were positive for haemogregarines at the time of introduction on the island (1994). Examination of blood smears from the tortoises in 2006 and 2008 indicated that the tortoises were still infected. However, tortoies born on the island have thus far tested negative for haemogregarines. Interestingly, 100% of tortoises were infested with *Amblyomma tuberculatum*, the gopher tortoise tick, at introductions. Biologists removed all ticks and treated

tortoises with acaricides. Since the introduction, only four tortoises infested with *A. tuberculatum* have been found on the island. These data suggest that gopher tortoises maintain long-term infection with this undescribed haemogregarine and that *A. tuberculatum* might be a vector. Future studies include repeated testing of tortoises that were introduced to the island, testing of tortoises from additional sites that do and don't have *A. tuberculatum*, and testing of ticks for developmental stages of the haemogregarine. These data will be combined with morphologic and genetic data to formally describe the gopher tortoise parasite.

9. PATEL, JAY[1*], NAMMALWAR SIRIANGANATHAN[1], HEDI NASCIMI[1], KURT ZIMMERMAN[1], W. EDWARD MONROE[1], MICHAEL J. YABSLEY[2], AND DAVID S. LINDSAY[1]. [1]Virginia Tech, Blacksburg, VA, [2]University of Georgia, Athens, GA. Comparison of the cruzipain and amastigote specific surface protein 4 genes of the Brazil strain of *Trypanosoma cruzi* with a recent dog isolate TcVT-1 from Virginia.

American trypanosomiasis is endemic in the Americas. There are 200,000 new cases of Chagas' disease each year in Latin America and presently it is estimated that there are 13 million people infected by the causative agent *Trypanosoma cruzi*. The parasite is associated with chronic heart disease. The parasite is present in the US but is primarily found in wildlife and rarely dogs. We isolated *T. cruzi* (the TcVT-1 strain) from the blood of a naturally infected 8 year-old, intact female English Cocker Spaniel that had never left Virginia. There are 6 major *T. cruzi* genotypes. Initial characterizations indicate that TcVT-1 is a type 4 strain. We are interested in developing a vaccine using the vaccine strain RB51 of *Brucella abortus* and engineering it to express protective antigens. Cruzipain is a good vaccine candidate because it is expressed on all 3 stages of the parasite. Amastigote specific proteins (ASP) are related to the trans-sialidase family of surface proteins and are attractive vaccine candidates. Based on sequence analysis of the cruzipan sequences, the TcVT-1 strain (969bp) and the Brazil strain (981bp) were 98.2% and 98.4% similar, respectively, to a reference strain in GenBank. Initial comparisons of the ASP4 between the two strains have indicated that there is more variability at this locus. This work was supported by an IRC grant from the office of Research and Graduate Studies, College of Veterinary Medicine, Virginia Tech to NS and DSL.

10. REIN, RACHEL*[1], THOMAS GREIG[2], WAYNE MCFEE[2], ISAURE DE BURON[1], AND STEVE ARNOTT[3]. [1]College of Charleston, [2]NOAA/NOS, Charleston, SC,[3] MRRI, Department of Natural Resources, Charleston, SC. Identification and distribution of gastric anisakids of pygmy sperm whales (*Kogia breviceps*).

The pygmy sperm whale, *Kogia breviceps*, is a poorly understood species as live sightings are rare and most of our knowledge comes from stranded animals. Anisakids were found in the stomach of 12 pygmy sperm whales stranded on the coast of South Carolina between 2008 and 2011. The aim of this study was to identify these worms and determine their distribution in the three stomach chambers of the whales. Preliminary results from one heavily infected whale are presented. Intensity was inferred from worm weight collected from each chamber and there were 6,800, 1,020, and 687 worms in the fore chamber, fundic chamber, and pyloric chamber, respectively. Scanning electron microscopy allowed the identification of a random sample of 14 worms as *Anisakis*, but did not allow for species identification. Sequencing of the ribosomal DNA (rDNA) internal transcribed spacers (ITS) was implemented in an attempt to identify species. Results from a region encompassing ITS-1, 5.8S ribosomal subunit, and ITS-2 of 98 specimens showed the presence of 5 species: 43 individuals of *A. brevispiculata*, 20 of *A. simplex* s.s., 17 of *A. paggiae*, 3 of *A. physeteris*, and 15 of *Anisakis* sp., a previously sequenced but not described species. All species were found in all three chambers except *A. physeteris*. Sympatric infection by *A. brevispiculata* and *A. paggiae*. was previously reported in *K. breviceps* from the western Atlantic, and *A. simplex* was found in *K. breviceps* stranded on the Yucatan Peninsula.

11. MORARU, GAIL M.*[1], JEROME GODDARD[2], CHRISTOPHER D. PADDOCK[3], AND ANDREA S. VARELA-STOKES[1]. [1]Department of Basic Sciences, Mississippi State University; [2]Department of Entomology and Plant Pathology, Mississippi State University; [3]Division of Viral and Rickettsial Diseases, Centers for Disease Control and Prevention, Atlanta, Georgia. *Rickettsia parkeri* infection in cotton rats and bobwhite quail.

The Gulf Coast tick, *Amblyomma maculatum*, is the primary vector of *Rickettsia parkeri*, a Spotted Fever Group (SFG) rickettsia. Cotton rats and bobwhite quail are known hosts for larvae and nymphs, but their role concerning *R. parkeri* is unknown. We performed experimental infections using *Rickettsia parkeri* (Portsmouth). One cotton rat and one quail were

inoculated with uninfected Vero cells as controls. Five of each species were injected with low dose culture, while five others of each species were injected with high dose culture. Two cotton rats and two quail were euthanized 2, 4, 7, 10, and 14 days post injection (dpi). Controls were euthanized dpi 14. Blood samples were collected for Vero cell culture, polymerase chain reaction (PCR) and indirect fluorescent antibody (IFA) testing. Spleen and a skin sample were removed from each animal for Vero cell culture and PCR. Cultures were also checked by PCR. Experimental animals euthanized dpi 7 or later were seropositive. *Rickettsia parkeri* was not isolated or detected by PCR in skin or blood from quail. Of the rats, one skin sample was PCR positive (dpi 4) and we isolated *R. parkeri* from five skin, one blood, and two spleen cultures. Spleen tissue samples are still being processed. This study suggests that cotton rats become infected with *R. parkeri* and harbor live organism systemically. They may play a more important role in transmission of *R. parkeri* than quail. This was funded by the Office of Research and Graduate Studies, College of Veterinary Medicine, Mississippi State University.

12. **CHARLES, ROXANNE A.*[1], SONIA A. KJOS[2], ANGELA E. ELLIS[3], AND MICHAEL J. YABSLEY[1,4]**. [1]Southeastern Cooperative Wildlife Disease Study, University of Georgia, Athens, GA. [2]Centers for Disease Control and Prevention, Atlanta, GA and currently at Marshfield Clinic Research Foundation, Marshfield, WI, [3]Athens Diagnostic Laboratory, College of Veterinary Medicine, University of Georgia, Athens, GA, [4]Warnell School of Forestry and Natural Resources, University of Georgia, Athens, GA. Comparison of the prevalence of *Trypanosoma cruzi* between southern plains woodrats (*Neotoma micropus*) and other known reservoirs from Uvalde County, Texas.

Chagas' disease (causative agent, *Trypanosoma cruzi*) is rare in the US, but is common in wildlife in the US and is a concern for domestic dogs is some states, especially Texas. In 2008 and 2010, we determined the prevalence of *T. cruzi* in several possible vertebrate reservoirs in southern Texas with an emphasis on the southern plains woodrat (*Neotoma micropus*). Because of frequent interactions of woodrats with reduviid vectors, we hypothesized that they would be very important reservoirs. A combination of culture isolation, polymerase chain reaction (PCR), and serologic testing was conducted. Based on PCR and/or culture), 25 of 104 (24%) woodrats were positive while 3 of 4 (75%) striped skunks, 5 of 20 (25%) raccoons, and 4 of 28 (14%) other rodents were positive. All raccoons were infected with genotype TcIV (formally IIa) but a mix of TcI and TcIV were detected in other rodent species and skunks. The Chagas Stat-Pak® assay was used to detect antibodies in woodrats and raccoons. Only 5 of the 24 positive woodrat samples (21%) were seropositive while all 5 infected raccoons were seropositive. Due to low sensitivity, indirect immunoflorescent antibody testing is pending. No histologic lesions attributable to *T. cruzi* were noted in the tissues of any woodrat. This is the first report of the prevalence of *T. cruzi* in southern plains woodrats in the US. Based on culture and/or PCR testing, the prevalence of *T. cruzi* in woodrats is comparable with other known reservoirs (i.e., raccoons and skunks).

13. **COX, STEPHANIE J.*[1], COVA R. ARIAS[2], AND STEPHEN A. BULLARD[1]**. [1]Department of Fisheries and Allied Aquacultures, Aquatic Parasitology Laboratory, Auburn University, Auburn, AL. [2]Aquatic Microbiology Laboratory, Auburn University, Auburn, AL. An unexpected trematode infection casts doubt on claim of "laboratory-reared" experimental zebrafish, *Danio rerio*.

Allegedly laboratory-reared zebrafish, *Danio rerio*, (Cypriniformes: Cyprinidae) were purchased and shipped to our laboratory from a California-based fish supply company for use as experimental subjects in pathobiology trials employing immersion challenge with the bacterium *Flavobacterium columnare*, the etiological agent of "columnaris disease." Upon running the challenge, it was observed that the fish were disease resistant, i.e., unusually low mortality. Subsequently, a few representative fish were euthanized and necropsied; whereupon, several trematodes were discovered beneath the scales of the fish, observed alive, heat-killed, and formalin-fixed. Subsequent staining and morphological study revealed them to be specimens of *Transversotrema patialense* (Digenea: Transversotrematidae). To our knowledge, this is the first confirmed report of a species of *Transversotrema* from North America. The life cycle of this fluke is known and includes the red-rimmed melania, *Melanoides tuberculatus* (Neotaeniglossa: Thiaridae) as the first and only intermediate host. This snail is an exotic, invasive, wide-ranging species in North America. It seems unlikely that the zebrafish we examined herein represented original broodstock that were wild-caught, shipped from Asia, and maintained in California for a period before being sent to us. Hence, we suspect this case study may represent a quaint example of a parasite that may now be established in North America by the fortuitous co-occurrence of a susceptible, introduced intermediate host (*M. tuberculatus*) and a susceptible, widely disseminated, non-native experimental model fish host (*D. rerio*).

14. WHITNEY M. KISTLER*[1,2], MICHAEL J. YABSLEY[1,2], TODD M. JOHNSON[1], SARAH ARNOLD[1], AND SONIA HERNANDEZ[1,2]. [1]Warnell School of Forestry and Natural Resources, University of Georgia, Athens, GA, [2]Southeastern Cooperative Wildlife Disease Study, University of Georgia, Athens, GA. Comparison of two detection methods of *Heamoproteus* in wild birds from Costa Rica.

Avian blood parasites in the genera *Haemoproteus* and *Plasmodium* infect over 120 avian species and have high morphological and genetic diversity. In general, in their natural hosts, these parasites do not cause morbidity or mortality, but there is evidence that *Haemoproteus* can affect the reproductive success of infected hosts. Traditionally, blood smears have been used to detect the presence of these parasites in avian populations; however, there are now several polymerase chain reaction (PCR) protocols that can be used to detect *Haemoproteus* and *Plasmodium* infections. To compare the sensitivity of these two methods, blood samples from 142 birds of 14 species from two locations in Costa Rica (San Luis and Las Cruces) were tested by blood smear and PCR analysis. Sample sites varied from intact forest fragments to human impacted areas (i.e., coffee plantations). In total, 40 of 142 (28%) birds were positive for *Haemoproteus* by blood smear and none were positive for *Plasmodium*. Based on PCR analysis, 57 of 142 (40%) were positive with a fair agreement of 70% between the two tests (K=0.326). Overall, significantly more samples tested positive with the PCR method compared to blood smears (McNemar's χ^2=5.9, p=0.015). Additionally, to distinguish *Haemoproteus* from *Plasmodium* without the need for sequencing, we determined that restriction enzyme EcoRV could be used to digest fragments into diagnostic bands. Although results indicate that PCR is more sensitive at detecting blood parasites, a combination of both is recommended so that morphological characteristics can be compared with sequence data.

15. UMBERGER, CARRIE M.* [1], ERIC J. MCELROY[1], ISAURE DE BURON[1], AND WILLIAM A. ROUMILLAT[2]. [1]College of Charleston, Charleston, SC. [2]MRRI, Department of Natural Resources, Charleston, SC. Effects of the parasitic nematode, *Philometroides paralichthydis*, on the swimming and burying performance of the southern flounder, *Paralichthys lethostigma.*

The southern flounder (*Paralichthys lethostigma*) is commonly parasitized by the philometrid, *Philometroides paralichthydis*. These nematodes embed themselves in place of the inclinator muscles of the dorsal and anal fin elements. We hypothesized that infection by these parasites impedes the fish use of these fins and we tested whether the swimming and burying performance of the infected fish is affected. Two groups of individuals (14 parasitized and 16 non-parasitized) ranging from 124 to 272 mm in total length were captured using trammel nets, otter trawls, and electro-fishing in the Charleston estuarine system. After acclimating in captivity for 24 hours, the fish were then individually filmed with high speed video cameras to determine swimming velocity and acceleration as a measurement of swimming performance as well as the time to bury and percentage of body exposed as a measurement of burying ability. Fish were then dissected, and the number, location, and stage of maturation of the worms were documented. Tests showed that the swimming acceleration and burying ability between the two groups did not differ. However, the swimming velocity of parasitized fish was significantly lower than that of non-parasitized fish, with smaller fish more affected than larger individuals with comparable parasite intensities. The position of the worms along the fins had no effect on either swimming or burying performance. Though the decrease in swimming velocity in the parasitized group seems slight, it could be sufficient to render small individuals more vulnerable to predation and thus explain the distribution of these parasites in nature.

16. UNDERHILL, CASEY, AND CHRIS HALL. Department of Biology, Berry College GA. The role of host-mediated phagocytosis in *Trypanosoma cruzi* invasion of placental trophoblast cells.

Despite the increasing importance attributed to the congenital transfer of *Trypanosoma cruzi* in the overall epidemiology of this parasite, little is understood about the mechanisms involved in the invasion of placental tissues. Previous studies have demonstrated the BeWo cell line to be a useful model for the invasion of placental syncytial trophoblast cells by *T. cruzi.* The current study addresses whether the invasion of BeWos by *T. cruzi* is mediated by host cell actin-dependent phagocytosis. The mycotoxin Cytochalsin-D is a potent inhibitor of actin polymerization, and consequently is highly effective in blocking phagocytosis. BeWo cells cultured in varying concentrations of cytochalasin-D were exposed to a Type IIa strain of *T. cruzi*. Cultures were monitored for changes in the timing of appearance and the percentage of BeWo cells hosting intracellular amastigotes. After fixing and staining, microscopic evaluation of the cultures found the

percentage of infected BeWo cells to be 5.01 - 6.41% in a manner independent of the concentration of cytochalasin D (P-value = 0.8356). This suggests that invasion of the placental syncytial trophoblast cells by *T. cruzi* is an active ATP-dependent process on the part of the parasite. This contributes significantly to our understanding of the mechanisms involved in the congenital transfer of *T. cruzi*.

17. GIRAO, FLAVIA A.*[1], JEROME GODDARD[2], CHRISTOPHER PADDOCK[3], AND ANDREA VARELA-STOKES[1]. [1]College of Veterinary Medicine, Mississippi State University, Mississippi State MS, [2]Department of Entomology and Plant Pathology, Mississippi State University, Mississippi State MS, [3]Infectious Diseases Pathology Branch, Centers for Disease Control and Prevention, Atlanta GA. Prevalence and ultrastructure of "*Candidatus* Rickettsia andeanae" in the Gulf Coast tick, vector of the human pathogen, *Rickettsia parkeri*.

Rickettsia parkeri, a spotted fever group *Rickettsia* (SFGR), was recognized in 2002 as a human pathogen. Transmitted by Gulf Coast ticks *(Amblyomma maculatum* Koch), it causes disease similar to, but milder than, Rocky Mountain spotted fever. More recently, a novel SFGR, and potential endosymbiont, "*Candidatus* Rickettsia andeanae" was also detected in *A. maculatum* but this species has not been thoroughly studied. In this study, we detected *R. parkeri* in 118 of 698 (16.9%) adult *A. maculatum* from Mississippi using PCR of the *rompA* gene. In addition, 23 of 698 (3.3%) ticks were positive for "*Ca.* R. andeanae". Surprisingly, 13 of 698 (1.9%) *A. maculatum* were co-infected with both species, the first report of co-infecting SFGR in *A. maculatum*. The relatively high prevalence of a suspected endosymbiont and *R. parkeri* co-infecting *A. maculatum* prompted subsequent investigations of "*Ca.* R. andeanae". To our knowledge, no morphological study has been performed with the novel SFGR, and a second objective was to describe it within the tick, particularly in relation to cell tropism. We used transmission electron microscopy to study adult *A. maculatum* that tested PCR-positive for "*Ca.* R. andeanae". Preliminary results showed bacteria, presumptively "*Ca.* R. andeanae", in salivary glands and ducts of female and male ticks. These data will generate evidence necessary to pursue more detailed studies. Through our findings, we hope to contribute to the current understanding of the complex biology of SFGR in the Gulf Coast tick. Grant sources: SECEBT (Southeastern Center for Emerging Biologic Threats) in 2009.

18. TRUONG, TRIET N.* AND STEPHEN A. BULLARD. Department of Fisheries and Allied Aquacultures, Aquatic Parasitology Laboratory, Auburn University, Auburn, AL. Comparative study on the parasite biodiversity of channel catfish (*Ictalurus punctatus*), blue catfish (*Ictalurus furcatus*), and hybrid catfish (female *Ictalurus punctatus* × male *Ictalurus furcatus*) in small pond aquaculture.

From January 2010 through February 2011 a study was conducted in three 0.1 acre earthen ponds at the E. W. Shell Fisheries Center (Auburn, AL) to compare the prevalence and biodiversity of parasites infecting channel catfish (CC), blue catfish (BC), and their hybrids (HC). Fingerling catfishes were communally stocked at equal density (750 individuals/species/pond), and 10 specimens of each catfish species per pond were examined in monthly collections for the presence of ectoparasites and endoparasites using stereomicroscopy and subsequent histology of brain, eye, gill, skin, fins, kidney, swim bladder, heart, liver, spleen, intestine, and stomach. Representatives of 6 higher taxa of parasitic metazoans were observed: Monogenea (HC- 174 of 184 infected [94.6%]; CC-99 of 99 [100%]; BC- 69 of 73 [94.5%]), Cestoda (HC- 86 of 184 [46.7%]; CC- 51 of 99 [51.5%]; BC- 26 of 73 [35.6%]), Copepoda (HC- 15 of 184 [8.2%]; CC- 16 of 99 [16.2%]); BC- 16 of 73 [21.9%]), Nematoda (HC- 1 of 184 [0.5%]; CC- 1 of 99 [1.0%]; BC- 0%), Unionidae (HC- 6 of 184 [3.3%]; CC- 0%; BC- 0%), and Myxozoa (HC- 63 of 184 [34.2%]; CC- 83 of 99 [83.8%]; BC- 7 of 73 [9.6%]). These preliminary results show no evidence that HC is refractory to initial infection by each major metazoan parasite taxon that infects its parental species. Species-level taxonomic studies will allow finer-scale understanding of these catfish parasite communities relative to the hybrid catfish, which is the lesser-known species that is of interest to the catfish aquaculture industry.

19. EDWARDS, JESSICA F. *[1], DAWN M. ROELLIG[2], AND MICHAEL J. YABSLEY[1,3]. [1]Department of Population Health, College of Veterinary Medicine, The University of Georgia, Athens GA. [2]Division of Parasitic Diseases and Malaria, Center for Global Health, Center for Disease Control and Prevention, Atlanta GA. [3]D.B.

Warnell School of Forestry and Natural Resources, The University of Georgia, Athens GA. United States *T. cruzi* elicits a weaker pro-inflammatory immune response in mice than South American *T. cruzi.*

Trypanosoma cruzi, causative agent of Chagas disease, is divided into six groups (Type I-VI), with only TcI and TcIV being found in the United States (US). Infection and virulence of *T. cruzi* isolates are dependent on numerous factors including parasite and host genetics. Murine models are frequently used to increase knowledge of the virulence, pathogenicity, and immune response of different *T. cruzi* strains. Previous studies have indicated that prolonged and exaggerated pro-inflammatory response to *T. cruzi* result in successful establishment and replication of the parasite which can result in morbidity or mortality. The aim of this study was to evaluate the cytokine expression profiles of outbred mice [Cr1:CD1(ICR)] to 2 South American (SA) and 7 US *T. cruzi* isolates and inbred mice [Balb/c, C57Bl/6, and DBA/2] to 3 SA strains. Previous studies have indicated SA isolates to be more virulent than US isolates in laboratory mice; therefore, we hypothesized that mice infected with SA isolates would initiate a stronger pro-inflammatory response than mice infected with US strains. Serum samples from two experimental studies were analyzed with a cytometric bead assay for major cytokines of Th1, Th2, and Th17 responses. Production of IFN-γ by C57Bl/6, Balb/c, DBA/2 and ICR mice inoculated with SA isolates was not significant; however, IFN-γ levels were significantly lower in ICR mice inoculated with US isolates ($p<0.05$). These results indicate ICR mice inoculated with SA strains produce a more exaggerated pro-inflammatory response compared with mice inoculated with US strains which may be an important factor in virulence.

20. GONYNOR- MCGUIRE, JESSICA L.*[1,2], ELIZABETH A. MILLER[1], LORA L. SMITH[2] AND MICHAEL J. YABSLEY[1]. [1]Warnell School of Forestry and Natural Resources, the Southeastern Cooperative Wildlife Disease Study, University of Georgia, Athens GA. [2] Joseph W. Jones Ecological Research Center, Newton GA. Parasites of gopher tortoises (*Gopherus polyphemus*) in Georgia.

The gopher tortoise is threatened or endangered throughout its range in the US. Although at least ten parasites have been reported from this host, little is known about their distribution and prevalence. One parasite of interest is the gopher tortoise tick (*Amblyomma tuberculatum*) which has rarely been found on deer, squirrels, domestic dogs and humans. Currently, little is known about its natural history or potential pathogens it may transmit. During the summers of 2009 and 2010, health exams were performed on gopher tortoises throughout southern Georgia. Fecal samples were examined from 71 tortoises and blood/ectoparasite samples were collected from 290 tortoises. Fecal parasites found included *Eimeria* (3% at 1 of 7 sites), *Alaeuris* spp. (79%, 6/7 sites), trichostrongyloidea (20%, 5/7 sites), and *Oochoristica* sp. (68%, 7/7 sites). A total of 467 ticks were found on 74 tortoises at four of seven sites. To date, 86% of 22 ticks were PCR positive for a novel spotted fever group *Rickettsia* spp. A blood sample of 1 of 75 tortoises was PCR positive for the same *Rickettsia* sp. This represents the most comprehensive survey of gopher tortoise for parasites. Interestingly, not all sites had *A. turberculatum* suggesting that the range of the tick is more restricted than that of its principal host. This is the first report of a tapeworm in gopher tortoises and we failed to find any *Ornithodorus turicata* despite this tick being common in Florida. Additional studies on the *Rickettsia* are needed given the potential pathogenic nature of some *Rickettsia*.

21. FAYTON, THOMAS*, OVERSTREET, ROBIN, AND HEARD, RICHARD W. Gulf Coast Research Laboratory, The University of Southern Mississippi, Ocean Springs, MS. Digenean parasites of a Florida Spring.

The expansive carbonate-rock aquifers of Central and Northwest Florida provide habitat for unique communities of spring-adapted organisms. Over 700 springs have been reported by the state of Florida, and the majority of these systems remain vastly understudied. Collectively, these habitats are characterized by rich and diverse invertebrate assemblages with high rates of endemicity for the Gastropoda, which dominate obligate macrofauna assemblages. Although various species of digenean parasites have been discovered in Floridian springs, only a small fraction of the springs has been sampled. To date no study has employed a holistic, species-specific, survey of the community of these parasites in individual springs. We report the preliminary findings of such a survey applied to a spring system in Florida and document the life cycles for six digenean species belonging to six families using gastropod intermediate hosts. This material is based upon work supported by the National Science Foundation Grant 0529684.

22. PURDEE, MICHAELLE*[1], BARBARA SHOCK[1,2], NOLA PARSON[3], ELIAZABETH HORNE[4], TRUDI MALAN[4], CLAIRE RICE[1], AND MICHAEL J. YABSLEY[1,2]. [1]Southeastern Cooperative Wildlife Disease Study, Department of Population Health, College of Veterinary Medicine, The University of Georgia, Athens, GA. [2]Warnell School of Forestry and Natural Resources, The University of Georgia, Athens, GA. [3]Southern African Foundation for the Conservation of Coastal Birds (SANCCOB), Cape Town, South Africa. [4]Penguins Eastern Cape, Cape St. Francis, South Africa. Hemoparasites in African penguins (*Spheniscus demersus)* and other South African marine birds.

The African penguin (*Spheniscus demersus*), the only penguin species that breeds in Africa, is endangered due to several challenges including diseases, oil spills, guan and egg harvesting, and reduced food availability. The current study was conducted to provide baseline prevalence data for hemoparasites. In addition, two diagnostic methods, thin blood smears and polymerase chain reaction (PCR) testing, were compared for ability to detect hemoparasites. We hypothesized that PCR would be more sensitive. To determine if *B. piercei* from African penguins also infected sympatric marine birds, we compared the internal transcribed spacer (ITS)-1 and ITS-2 sequences from *B. piercei* with sequences from *Babesia* from Cape Gannets (*Sula capensis*), Cape Cormorants (*Phalacrocorax capensis*), and Bank Cormorants (*P. neglectus*). Additionally, ectoparasites were collected from penguins admitted to one of the rehabilitation centers. *Babesia* was detected in blood smears of 2 of 66 (3%) juvenile Cape gannets and 2 of 23 (9%) penguins. PCR did not detect additional positives; however, a single penguin that was blood-smear negative following treatment with primaquine, was subsequently PCR positive. Genetic variation was greatest in the ITS-2 region but both targets could distinguish *B. piercei* from *Babesia* from cormorants and gannets. Although some genetic variation was noted among *Babesia* samples from cormorants and gannets, we believe they are the same species. All admitted penguin chicks were infested with ticks, a subset were identified as *Carios capensis.* These data provide evidence that at least two *Babesia* species are circulating in South African marine birds.

23. PALMIERI, JAMES R.[1], SHAADI F. ELSWAIFI[1], DAVID S. LINDSAY[2], GRETCHEN JUNKO*[1], AND CATHY CALLAHAN[1]. [1]Department of Microbiology, Infectious, and Emerging Diseases, Edward Via College of Osteopathic Medicine. [2]Department Biomedical Sciences and Pathobiology, Virginia Maryland Regional College of Veterinary Medicine. Case Report: Chronic Microsporidial Enteritis in a Missionary from Mozambique.

Microsporidiosis often occurs in immunocompromised persons but may also occur in those who are immunocompetent. Infection by Microsporidia involves a variety of organs and systems, most notably, intestine, lung, kidney, brain, sinuses, muscle, and eyes. *Enterocytozoon bieneusi* and *Encephalitozoon intestinalis* are associated with gastroenteritis, and *Enterocytozoon hellem* and *Encephalitozoon cuniculi* are associated with keratoconjunctivitis. We report a case of chronic microsporidiosis in a 28-year-old woman missionary from Mozambique who came to our diagnostic laboratory with nausea, lower abdominal pain, and frequent bowel movements. Over two years, the patient was clinically assessed and treated for malaria and giardiasis without laboratory diagnosis while in Mozambique. Identification of the causative agent of her condition was not attempted during the course of her illness in Mozambique. Furthermore, adverse effects of malaria and giardiasis medications may have exacerbated the chronic illness in this patient and mimicked chronic microsporidiosis.

24. MCELWAIN, ANDREW[1]*, STACEY A. LAFRENTZ[2], COVADONGA R. ARIAS[2], AND STEPHEN A. BULLARD[1]. [1]Aquatic Parasitology Laboratory, Department of Fisheries and Allied Aquacultures, Auburn University, Auburn, AL, [2]Aquatic Microbiology Laboratory, Auburn University. A Unionid Histological Atlas.

Freshwater mussels (Bivalvia: Unionidae) are parasites requiring a fish intermediate host to accommodate their larval dispersal stage (glochidium). Despite their fame as unlikely parasites and their high species diversity in Alabama (178 species of 43 genera), scant specific information has been published on the histological features of freshwater mussels; with most taxonomic information deriving from their shells. As a service to the Alabama Department of Conservation and Natural Resources, we proposed to develop a histological atlas for freshwater mussels. The Alabama rainbow, *Villosa nebulosa*, was selected as the model mussel because it is easily identifiable in the field, we can obtain wild specimens year-round and in large numbers, and we have access to cultured, specific pathogen free specimens across a range of sizes

and year-round from ADCNR's Alabama Aquatic Biodiversity Center. Herein, we present our preliminary results in assembling this project. Our hope is that the resulting "Mussel Atlas" will help establish baseline health information for freshwater mussels, aid in traceability studies subsequent to mussel die-offs, offer insights into the use of mussel tissues as bioindicators, and assist in disease diagnostics and health checks of cultured freshwater mussels before they are released into the wild.

25. FRIED, KAREN*, JAMES R. PALMIERI, SHAADI F. ELSWAIFI, AND ARBEN SANTO. Department of Microbiology, Infectious, and Emerging Diseases, Edward Via College of Osteopathic Medicine. A Misdiagnosed Case of Paragonimiasis in a Patient with Multiple Sclerosis.

Fifty million people travel from the developed world to developing countries each year; 20 to 70 percent report a travel-associated illness. Those who remain within the United States are at risk for contacting infectious diseases as immigrant populations introduce them to new areas. This case report involved a 27-year-old female diagnosed with multiple. Due to high-dose corticosteroid treatment for an MS relapse, she had a flare-up of previously-diagnosed gastroesophogeal reflux disease with hiatal hernia. She experienced prolonged severe upper abdominal pain and underwent an esophagogastroduodenoscopy. A mid-esophageal lesion was seen and biopsied. The pathologist's report of the biopsy indicated the presence of a parasite egg suggestive of the oriental lung fluke *Paragonimus westermani.* She had no travel-related illness or pulmonary symptoms and had never eaten crab, crayfish, or any other intermediate host of *P. westermani*. The patient presented the biopsy slide to our laboratory and a microscopic examination determined the "egg" was a pollen spore, possibly from slide contamination. Negative fecal and sputum samples taken by the patient's physician substantiated these findings. The esophageal lesion was likely due to repeated use of NSAID medication to reduce the flu-like side effects of her MS treatment. Presently, in the United States, many infectious diseases are either undiagnosed because of the lack of access to health care or are misdiagnosed due to inadequate training of healthcare providers. It is imperative that medical institutions and healthcare providers, both public and private, are properly trained to diagnose and treat both emerging and reemerging infectious diseases.

26. KANSAS SPARKS[1], MATTHEW TUCKER[1], FRANCOIS NOSTEN[2], AND DENNIS E. KYLE[1]. [1]University of South Florida College of Public Health; [2]Shoklo Malaria Research Unit. Defining the Elusive In Vitro Artemisinin Resistance Phenotype of *Plasmodium falciparum.*

Artemisinin combination therapy (ACT) is the most effective drug treatment available for *Plasmodium falciparum* malaria. Recent studies conducted in Cambodia and Thailand have demonstrated the first signs of clinically relevant resistance to ACTs with an increasing number of treated patients failing to clear parasitemia for up to 3-4 days. Previously the parasite clearance times were always less than 48 hrs. Despite the clear clinical signal of resistance, suitable laboratory methods do not exist to document the spread of resistance. For example, in vitro drug susceptibility methods used for other antimalarial drugs do not detect significant differences in clinically resistant versus sensitive parasites. New laboratory methods are urgently required. Herein we report on a series of studies designed to define an in vitro artemisinin resistance phenotype. Initially we compared the in vitro drug susceptibility responses of recent patient isolates obtained from Mae Sod Thailand with historical data obtained from patients at the Bangkok Hospital for Tropical Diseases between 1991-1999. Geometric mean IC50s were determined for artesunate, mefloquine, dihydroartemisinin, and atovaquone. Data for the 189 patient isolates from the 1990s versus the 47 patients from 2008 suggested in vitro drug sensitivity to ACTs remains high. An alternate conclusion is the widely used in vitro methods are not sufficient to define the artemisinin-resistance phenotype. Finally we will report on two new in vitro drug susceptibility tests and how they are being used to define the elusive in vitro resistance phenotype.

27. ELSWAIFI, SHAADI F.*, JAMES R. PALMIERI, CATHERINE MINICHINO, AND GENEVA GEHRING. Department of Microbiology, Infectious, and Emerging Diseases, Edward Via College of Osteopathic Medicine. Uptake of Nanoparticles of Cerium Oxide and Yttrium Oxide by *Acanthamoeba castellanii* (Protozoa) and *Daphnia magna* (Crustacea).

Nanoparticles are synthesized and used at an unprecedented rate for industrial, medical, and research applications. Use of cerium oxide nanoparticles (CeONP) and yttrium oxide nanoparticles (YtONP) results in their spread as environmental

contaminants. This spread may result from the process of their synthesis, as a by-product of their use, or from their indiscriminate disposal after use. As with many of the engineered nanoparticles, CeNOP and YtONP may also have toxic effects on humans and animals. Routes of exposure of humans to these nanoparticles are poorly understood. Two of the route of exposure of CeONP and YtONP may be through the contamination of organisms in the food-chain or through contamination of drinking water. In this study we determine whether protists and crustaceans play a role in the transfer of CeONP and YtONP from the environment to the food chain. *Acanthamoeba castellanii*, a protist, and *Daphnia magna*, a planktonic crustacean, were exposed to CeONP or YtONP to determine if the nanoparticles could be uptaken by these organisms. Our results demonstrate that CeONP and YtONP can be readily uptaken by *A. castellanii* and *D. magna*, two components in the aquatic food chain. We have also demonstrated that after uptake, CeONP and YtONP are associated with cell and organelle membranes in these organisms.

28. **HOTT, AMANDA M.*, MATTHEW TUCKER, AND DENNIS E. KYLE**. Department of Global Health, College of Public Health, University of South Florida, Tampa FL. Characterization of artelinic and artemisinin resistant Plasmodium falciparum.

The emergence of clinical resistance to artemisinin drugs in Southeast Asia is a major concern since artemisinin-combination therapies (ACTs) serve as the basis for the first line therapy for multidrug resistant malaria. The identification of putative molecular markers of artemisinin resistance are critically needed to enhance assessment of the emergence and spread of these new resistant genotypes. Recently we have selected for high grade, stabile resistance to artelinic acid (AL) and artemisinin (QHS) in vitro in several lines of P. falciparum. We have used these lines to search for novel molecular markers of resistance and have identified a new copy number variant in two independently derived AL and QHS resistant progeny. Each of these resistant lines are stabile in vitro culture and the resistant lines tolerate >8 ug/ml drug pressure in vitro. In this study we have examined the resistant progeny at levels of selection from 2 ng/ml AL up to 2.4 ug/ml of QHS. Quantitative real time PCR analysis confirmed the amplification of a 10 gene amplicon in W2 and a completely overlapping 19 gene amplicon in D6. Interestingly, the amplicon in W2 is 3 copies and in D6 is 2 copies. Evidence of this novel copy number variant (CNV) occurred as early as the 5 ng/ml drug pressure in W2, whereas it emerged later in D6. Currently we are determining if there is evidence of this CNV in parasites isolated from patients in SE Asia that exhibited the long parasite clearance phenotype.

29. **HICKLING, GRAHAM J.*[1], JESSICA R. HARMON[1,2], M. CATHY SCOTT[1], AND CARL J. JONES[2]**. [1]Center for Wildlife Health and [2]Department of Entomology and Plant Protection, University of Tennessee Institute of Agriculture, Knoxville TN. Emergence of tick-borne disease in a Tennessee 'exurban' community.

Lyme disease in northeastern U.S. has captured the public's attention as a recent example of an emerging vector-borne zoonotic disease. Concurrently, the southeastern U.S. has seen emergence of other tick-borne diseases (TBDs), several only recently identified. As an example, we are tracking emergence and maintenance of *Ehrlichia* spp. pathogens among ticks in a retirement community in middle Tennessee. The community was established in previously-forested habitat in the mid-1980s, with much wildlife habitat retained for recreational and aesthetic reasons. Soon thereafter a major outbreak of ehrlichiosis occurred at the site; epidemiological investigation at the time associated disease cases with *Amblyomma americanum* ticks. Community managers thereafter took a range of actions aimed at reducing these tick populations, including the use of host-targeted acaracides. In 2008-10, we revisited the community and surveyed tick abundance and pathogen status. *A. americanum* remained widespread and highly abundant throughout the community. Control measures are having only short-range effects on the tick population, and are not providing community-level benefits. Three distinct *Ehrlichia* species are present within the *A. americanum*, at prevalences similar to that found in a comparison area where there has been no tick management. We conclude that expansion of 'exurbs' in the Southeast is exacerbating tick-borne disease problems that at present remain intractable at the community level.

30. **OSCAR J. PUNG*[1], KYLE N. ROBERTSON[1], TERRY LESTER, JR.[1], AND BRIAN LUND FREDENSBORG[2]**. [1]Department of Biology, Georgia Southern University, Statesboro, GA. [2]Department of Biology, University of Texas-Pan American, Edinburg, TX. The parasite or the protocol: In vitro fertilization and reproduction of *Probolocoryphe lanceolata* (Trematoda: Microphallidae) in a culture system developed for the trematode *Microphallus turgidus*.

Most attempts to grow adult digeneans in vitro are unsuccessful. However, we have developed a culture procedure in which metacercariae of *Microphallus turgidus* are fertilized and then produce eggs infective to hydrobiid snails. The objective of the present study was to determine if the successful cultivation of *M. turgidus* was due to a characteristic of that parasite or to our culture conditions. To answer this question, we tested the culture system on a different microphallid, *Probolocoryphe lanceolata*. The experiment was performed 3 times as follows. Metacercaria of *P. lanceolata* from the digestive gland of fiddler crabs, *Uca rapax*, were excysted in warm saline, washed and incubated overnight at 37 C in saline-filled conical-bottom tubes. The next day, we determined the percentage of worms fertilized and then cultured them in 24-well plates containing RPMI-1640 with 20% horse serum. Plates were incubated 7 days at 41.5 C in a gas phase of air. Next, eggs were harvested, counted, incubated in brackish water for 10 days at 30 C on a 12 hr light/dark cycle and examined. After overnight incubation in a conical-bottom tube, 82-93% of freshly excysted worms were fertilized. After 7 days in culture, an average of 53 eggs/worm was released. An average of 58% of eggs incubated 10 days in brackish water was embryonated and many of the eggs appeared to contain miracidia. We conclude that *P. lanceolata*, like *M. turgidus*, is readily fertilized in vitro and produces potentially infectious eggs in our culture system.

31. **VARELA-STOKES, ANDREA S. [*1], FLOYD D. WILSON[2], DANA AMBROSE[3], ALYSSA SULLIVANT[4], AND G.J. VAN DAM[5]**. [1]College of Veterinary Medicine, Mississippi State University, Starkville, MS. [2]Mississippi State Research & Diagnostic Laboratory, Mississippi State University, Pearl, MS. [3]College of Veterinary Medicine, University of Georgia, GA. [4]Desoto County Animal Clinic, Southaven, MS, [5]Department of Parasitology, Leiden University Medical Center, Leiden, The Netherlands. *Heterobilharzia americana* in a Mississippi dog: Are we underdiagnosing this?

Heterobilharzia americana is trematode that normally parasitizes raccoons as a reservoir definitive host, but may also infect a wide variety of wild mammals including beavers and bobcats, as well as domestic canids. It is most commonly seen along the Gulf Coast and southeastern United States. Despite the small number of cases reported in dogs, recent studies indicate that the disease is more widely distributed than previously suspected and may be underdiagnosed. This may reflect nonspecific clinical signs that may be confused with more common diseases producing gastrointestinal symptoms. We report the clinical and histopathological findings for one case of heterobilharziasis recently diagnosed in an 8-year-old male, neutered, mixed breed dog from the Mississippi Delta with a history of chronic diarrhea, vomiting and weight loss of over 20 pounds in six months. Initial bloodwork revealed eosinophilia and neutrophilia. Diagnosis was tentatively based on history and histopathological findings from punch biopsies of the intestines where numerous pyogranulomatous nodules were scattered throughout the mucosa, submucosa and muscularis and characteristic ova lacking a spine were typically present within the center of the granulomas. This was confirmed by serologic detection of circulating anodic antigen (CAA), an antigen highly specific for human schistosomes that has become useful for diagnosis of canine schistosomiasis. The case represents the only documented case of *H. americana* diagnosed over the past few decades at the Mississippi State Diagnostic Laboratory in spite of being apparently widespread throughout the Gulf Coast states. This further underscores the possible underdiagnosis of the disease.

32. **CURRAN, STEPHEN, S., AND ROBIN M. OVERSTREET**. Department of Coastal Sciences, The University of Southern Mississippi, Ocean Springs, MS. Changes in the parasite fauna of the Atlantic croaker, *Micropogonias undulatus*, from coastal waters impacted by the Deepwater Horizon oil spill.

Parasites of marine fish are affected by their hosts' exposure to polycyclic aromatic hydrocarbons (PAH). Gill parasites with direct life cycles tend to exhibit sustained increases in prevalence and mean intensity of infestation in PAH chronically exposed fish. Gill parasites are thought to benefit from PAH-induced gill hyperplasia, excess mucus production, and reduced immune system function. In contrast, gut parasites with indirect life cycles tend to exhibit decline under the same conditions. Gut parasites are perhaps adversely affected when hosts drink PAH-contaminated seawater during their normal osmoregulation. Additionally, environmental contamination may lead to the eventual extirpation of intermediate hosts, thus breaking parasite life cycles. On 20 April 2010, the Deepwater Horizon oil platform exploded off the coast of Louisiana releasing crude oil into the Gulf of Mexico. In an attempt to investigate the effects of the spill on a parasite assemblage, we compared historical prevalence and mean intensity of parasites from Atlantic croakers from Ocean Springs, MS, examined during October of 1970 (n=72), 1971 (n=57), 1975 (n=60), 1976 (n=39), and 1992 (n=30), with data collected from Atlantic croakers (n=240) from 3 sites in the spill hemisphere between September and November of 2010. The gill parasite assemblage of 2010 experienced higher prevalence values for some species and included a novel

parasite suggesting that hosts were possibly impacted by petroleum. The 2010 gut parasite assemblage was initially depauperate but diversity gradually increased to pre-spill levels later in the study. Funding was provided by the Northern Gulf Institute/Gulf of Mexico Research Initiatives.

33. **POWELL, MALCOLM R**. Department of Biology, Western Carolina University, Cullowhee, NC. Chagas disease in the Americas.

Numerous sero-surveys, primarily to address epidemiological and public health issues, have been conducted in a variety of countries to estimate the prevalence of *Trypanosoma cruzi* infection and Chagas disease. We conducted two such studies in the endemic areas of Guatemala; the first to determine overall prevalence (n=4450) and the second in school children to determine areas of active transmission (n=8136). Overall prevalence was estimated at 5.28%. Prevalence in school children was lower, but revealed several specific foci where incidence was >20% thereby indicating prime areas for intensive vector control efforts. Moreover, during the course of these studies we noted considerable discrepancy between the results obtained with different serological tests, especially with sera obtained from different age groups and different locales. These data are of particular interest regarding the possible threat to the US blood supply because of extensive immigration of persons from Chagas endemic areas. In fact, in 2006 the FDA recommended, but did not mandate, US blood banks begin testing using a recently FDA approved ELISA. Testing began in January of 2007 and to date several thousand units of donated blood have been identified as repeat ELISA positive. Some of these samples were submitted to the American Red Cross for further testing using a radio-immunoprecipitation assay (RIPA), which is considered the gold standard. As of March 2011, over 1300 units have been identified as RIPA positive. These data indicate the need for continued testing of the US blood supply and continued refinement of the assays used.

34. **PALMIERI, JAMES R.* AND SHAADI F. ELSWAIFI**. Department of Microbiology, Infectious, and Emerging Diseases, Edward Via College of Osteopathic Medicine. Emerging Need for Parasitology Education: Training to Identify and Diagnose Parasitic Infections.

Parasitic diseases are among the most common chronic infections in the world's poorest people and have a tremendous impact on global health. Even with increased global awareness and increased allocation of resources from governmental and major philanthropic organizations worldwide, the incidence of parasitic diseases continues to rise with the poorest nations disproportionately impacted. In our laboratory over the past six months we have identified parasitic infections in four individuals that were misdiagnosed. Three of them had a chronic parasitic infection that persisted for more than two years. Presently, in the United States, many parasitic infectious diseases are either undiagnosed because of the lack of access to health care or are misdiagnosed due to inadequate training of healthcare providers. It is imperative that medical institutions and healthcare providers, both public and private, are properly trained to diagnose and treat both emerging and reemerging parasitic infectious diseases. In professional school and post-graduate training, there are ample opportunities to develop hands-on skills through a variety of experiences, including microbiology and infectious diseases courses, wet-laboratory experiences, workshops, and through volunteering at free clinics and on mission trips. These valuable experiences will complement the students' education in the basic and clinical sciences and will provide them with the knowledge and experiences to combat the globalization of infectious diseases.

35. **GERHOLD, RICHARD*[1,2], LARRY MCDOUGALD[1], ROBERT BECKSTEAD[1], AND KATE HAYDEN[3]**. [1]Poultry Science Department, University of Georgia, Athens GA. [2]The Center for Wildlife Health, Department of Forestry, Wildlife, and Fisheries, The University of Tennessee, Knoxville, TN. [3]Kentucky Department of Fish and Wildlife Resources, Frankfort, KY. Detection and epidemiology of *Trichomonas gallinae* in Peregrine falcon nestlings in Kentucky.

Peregrine falcons (*Falco peregrinus*) are considered threatened and significant funds have been advocated for adult and nestling banding and population census. Avian trichomonosis, caused by the protozoal parasite *Trichomonas gallinae*, is considered one of the most important diseases for Peregrine falcon population recruitment. Since 2008, the Kentucky Department of Fish and Wildlife Resources (KDFWR) personnel have obtained oral swabs from 33 falcon nestlings, in conjunction with population monitoring and banding, from various locations within the state. Swabs were inoculated into In-Pouch™ TF kits, for overnight transport to our laboratory. In-Pouch™ TF kits were incubated at 37 C and

microscopically examined daily for at least five days for trichomonad growth. Nucleotide sequences of the internal transcribed spacer (ITS)-1, 5.8S, and ITS2 regions of the ribosomal RNA gene were analyzed from the positive trichomonad samples to determine the *T. gallinae* genotype. Of the 33 tested nestlings, three nestlings (9.1%) were positive for trichomonad growth by culture. All of the positive nestlings originated from the same nest. All three ITS-5.8S sequences were identical and belonged to the rock pigeon genotype. These results suggest that a single infected prey item was likely responsible for infection of the three nestlings. The KDFWR will continue to monitor falcon nests and test nestlings for *Trichomonas* for the next 3 years.

36. **STEPHEN A. BULLARD.** Department of Fisheries and Allied Aquacultures, Aquatic Parasitology Laboratory, Auburn University, Auburn, AL. Revisionary systematics and coevolution of blood flukes infecting non-tetrapod craniates.

The "fish blood flukes" (Digenea: Aporocotylidae) presently number approximately 126 species of 30 accepted genera, many of which are monotypic, that mature in the blood and body cavity of freshwater, marine, and estuarine fishes worldwide. They are the aquatic counterparts and close relatives to schistosomes (Schistosomatidae), but if schistosomes are the most well-studied of flukes aporocotylids are arguably the least understood. No published phylogeny includes all aporocotylid genera, most primary host lineages remain undersampled, and aporocotylid-fish cophyly remains untested. Herein, a strict consensus of the 22 most parsimonious trees generated from an analysis of 204 unordered, unweighted morphological characters and 36 representative aporocotylid taxa yielded a tree topology in which the fish blood flukes can be divided into monophyletic groups that infect four primary fish lineages: (i) holocephalans + sharks, (ii) basal actinopterygiians + elopomorphs, (iii) otophysans, and (iv) euteleosts. This preliminary result suggests that phylogenetic host specificity among aporocotylids is structured at the level of higher order craniate subdivisions, most basal aporocotylids infect freshwater fishes, and host switching events involve euryhaline fishes acquiring freshwater blood flukes. Supported by NSF Revisionary Systematics grant number DEB-1048523.

37. **TEIXEIRA, MARIA A. *[1,2], PATRICIA L. DORN[3], DAWN M. ROELLIG[4], STEPHEN A. KLOTZ[5], JUSTIN O. SCHMIDT[6], AND MICHAEL J. YABSLEY MJ[2,7]**. [1] Federal University of Mato Grosso do Sul, Campo Grande, MS, Brazil; [2] Southeastern Cooperative Wildlife Disease Study, Department of Population Health, College of Veterinary Medicine, The University of Georgia, Athens, GA; Loyola University New Orleans, New Orleans, LA, [4]Centers for Disease Control and Prevention, Atlanta, GA; [5]Section of Infectious Diseases, University of Arizona, Tucson, AZ; [6]Southwestern Biological Institute, Tucson, AZ; and [7]D.B. Warnell School of Forestry and Natural Resources, The University of Georgia, Athens, GA. Genetic similarity among *Trypanosoma cruzi* from diverse sources and geographical regions of the United States.

Trypanosoma cruzi, which exhibits broad genetic variation, has been classified into two major lineages, *T. cruzi* I (TcI) and *T. cruzi* II-VI (previously TcIIa-e) and TcI has been further classified into 5 haplotypes. The purpose of this study was to determine the haplotypes of 41 TcI samples from the United States including ones from humans, domestic dogs, raccoons, opossums, armadillos, and several species of vectors (*Triatoma sanguisuga*, *T. gerstaeckeri*, *T. protracta*, and *T. rubida*). Samples were from throughout the southern range of *T. cruzi* in the U.S. and included Arizona, Texas, Louisiana, Florida, and Georgia. The haplotypes were determined by sequence analysis of the mini-exon gene intergenic region followed by phylogenetic analysis of the entire sequence with other sequences from South America. Based on sequences of a 45 bp microsatellite motif in the mini-exon gene intergenic region, all of the U.S. TcI samples were characterized as haplotype TcIa. Phylogenetic analysis of the entire (~250 bp) sequence of mini-exon gene intergenic region of the U.S. samples confirmed their placement in the TcIa group. Although the sequences of the U.S. isolates differed among themselves and from those from South America, all of the U.S. Tc1a samples fell into in a large, unresolved clade. These data suggest that TcIa is the predominate *T. cruzi* haplotype found in U.S. vertebrate hosts and vectors and the U.S. *T. cruzi* samples are closely related to South American Tc1a.

38. **DOVE ALISTAIR D.M. *[1], TONYA CLAUSS[1], DAVID MARANCIK[2] AND ALVIN CAMUS[2].** [1]Correll Center for Aquatic Animal Health, Georgia Aquarium. 225 Baker St., Atlanta GA 30313; [2]College of Veterinary Medicine, University of Georgia, Athens GA. The leech *Branchellion torpedinis*: a significant pathogen of demersal elasmobranchs in a large aquarium.

Clinically significant leech infestations are relatively uncommon. Except for their relatively long life span, however, leeches share many of the characteristics of problem pathogens in closed systems, including a simple life cycle and low host specificity. *Branchellion torpedinis* became a significant challenge in the maintenance of a collection of demersal elasmobranchs in a large marine exhibit (24 million liters) at the Georgia Aquarium. The parasite sheds long-lived eggs free in the water column rather than adhering cocoons to hard surfaces like most leeches. It can attain body sizes over 4cm in length and shows a tropism for cryptic sites such as the orobranchial cavity, cloaca and nares. Transmission can occur by recruitment of new larvae but also by direct contact between hosts resulting in horizontal transfer of adult leeches. Profound anaemia has been observed in severe cases, both naturally occurring and during challenge trials. An integrated disease management strategy was instituted that relied upon the manual removal of adult leeches during periodic physical exams, combined with an intensive exhibit maintenance diving schedule aimed at reducing the number of eggs in the substrate. These efforts are being enlightened by continuing studies of the life history and biology of this unusual pathogen, but the removal of the primary host, *Rhinoptera bonasus*, from the exhibit has alleviated much of the clinically significant disease.

39. **RIPLEY, ALLYSON[1], HEATHER D. STOCKDALE[2], DAVID C. GRANT[1], BYRON L. BLAGBURN[3], AND DAVID S. LINDSAY[1*].** [1]Virginia Tech, Blacksburg, VA, [2]University of Florida, Gainesville, FL, [3]Auburn University, Auburn, Al. Survival of a feline isolate of *Tritrichomonas foetus* in the environment

Feline intestinal tritrichomoniasis caused by *Tritrichomonas foetus* is associated with large bowl diarrhea in cats from many parts of the world. For many years this protozoan in cats had been misidentified as *Pentatrichomonas hominis*. It was demonstrated that the protozoan previously identified, as *P. hominis* in cats was actually *T. foetus* using rRNA gene sequencing; restriction enzyme digestion, and microscopy. These finding were bolstered after it was proven that isolates of *T. foetus* from cattle were infectious for the large intestine of cats and isolates of *T. foetus* from cats were infectious for the reproductive system of cattle. *Tritrichomonas foetus* is a sexually transmitted disease in cattle and a cause of early abortion in cows. The parasite is assumed to be maintained by fecal-oral transmission in cats. Clinical infections are associated with large bowel diarrhea. The present study was conducted to examine the survival of a feline isolate of *T. foetus*, AUTf-12, under various conditions that are relevant to fecal-oral transmission in cats. Trophozoites were grown in TYM medium and then exposed to water, cat urine, dry cat food, clumping cat litter, cat hair, filter paper or acid pepsin solution for various lengths of time and then re-cultured in TYM medium. Results demonstrated that viable trophozoites were present following exposure for up to 15 minutes in water, 5 minutes on filter paper, 10 minutes on cat food and 15 minutes in cat litter. Results of survival in cat urine, acid-pepsin solution, and on cat hair are currently being conducted.

40. **FAULKNER, CHARLES, SARAH DECKER, ALY CHAPMAN, AARON BAUMANN, AND SHARON PATTON**. University of Tennessee College of Veterinary Medicine, Knoxville TN. Comparison of Fecal Flotation Methods for Detection of Endoparasitic Infections in Dogs.

Centrifugal fecal flotation is recommended by The Companion Animal Parasite Council as a *best practice* for the detection of endoparasitic infections in companion animals receiving care at veterinary practices. This study was undertaken to compare the relative performance of three fecal flotation protocols centrifugal flotation using Sheather's sucrose (SS), specific gravity (SG) 1.276; centrifugal flotation using saturated zinc sulfate solution ($ZnSO_4$), SG 1.18; and passive flotation with $ZnSO_4$, SG 1.18. Fecal samples obtained from random source dogs (n=133) were processed for microscopic examination of diagnostic parasite stages (DPS) by trained laboratory diagnosticians. Each fecal sample was evaluated by all 3 methods. Relative performance of each flotation method was assessed by: its ability to detect the presence/absence of DPS; and its ability to detect ordinal scale parasitic infections ranked as few (1-10), moderate (11-30), or many (30+) DPS per slide. In all cases, diagnosticians were blinded from results obtained by prior evaluation of each sample with the other flotation methods. The performance of each flotation method was compared with the Kappa Coefficient of agreement. Centrifugal flotation with SS or $ZnSO_4$ exhibited substantial agreement for the simple detection of parasitic infection. However, comparison of centrifugal $ZnSO_4$ flotation with passive $ZnSO_4$ flotation resulted in moderate agreement and 60% more infections were detected by the centrifugal method. The effect of flotation solution SG on parasite detection was pronounced for *Giardia sp.* and agreement between SS and $ZnSO_4$ was fair compared to the moderate level of agreement exhibited by either flotation method with $ZnSO_4$.

41. **ZELMER, DEREK A.** Department of Biology and Geology, University of South Carolina Aiken, Aiken, SC. Ecological drift in parasite infracommunities.

Ecological drift, a key component of the unified neutral theory of biodiversity and biogeography, is an extension of the assumption of species equivalence proposed as part of the equilibrium theory of island biogeography. Many parasite infracommunities have been characterized as colonization-dominated systems, suggesting that stochastic processes might play a large role in infracommunity structure. In addition to species equivalence and stochastic structuring, ecological drift requires zero-sum dynamics, such that colonization only can occur when habitat has been made available through the loss of individuals. Examination of the relationship between variation in local abundance and metacommunity relative abundance for a quadratic signature provides a facile test of the assumption of zero-sum dynamics. The test is of limited utility in free-living communities because metacommunity relative abundances tend to be lower than 0.5, the predicted point of peak variation, but high relative abundances are not as uncommon in parasite component communities. The relationship between the variance in infrapopulation abundances as a function of component community relative abundance is examined for component communities of fishes, frogs, and turtles, revealing no evidence of a quadratic signature.