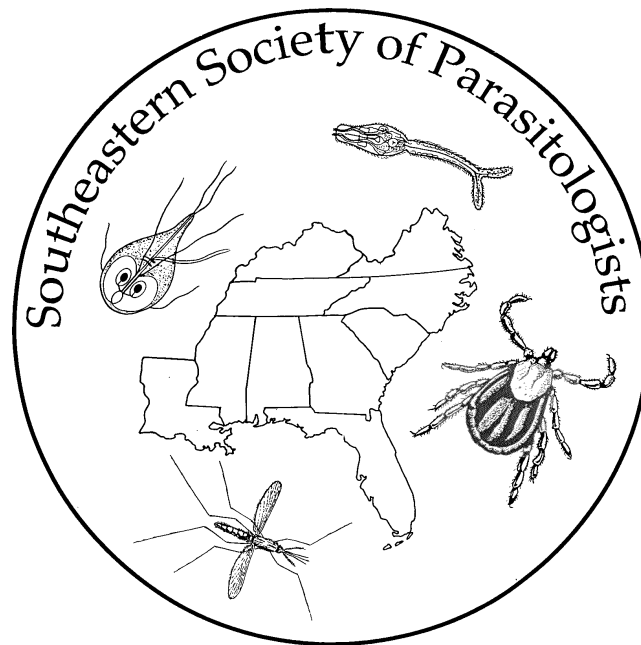


SOUTHEASTERN SOCIETY OF PARASITOLOGISTS

(Affiliate of The American Society of Parasitologists)

PROGRAM AND ABSTRACTS



March 21 - 23, 2012

Hosted by:

**School of Allied Health Sciences
Lincoln Memorial University
Pine Mountain State Park
Pine Mountain, KY**

SOUTHEASTERN SOCIETY OF PARASITOLOGISTS

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Southeastern Society of Parasitologists 2012 Program Summary

Meeting Registration/Check In

Wednesday, March 21, 2012 8:00 a.m. – 8:00 p.m.

SSP Executive Committee

Wednesday, March 21, 2012 3:00 – 5:00 p.m.

Location: TBA

SSP Presidential Symposium

Wednesday, March 21, 2012 5:30 p.m.- 7:30 p.m.

Location: *Laurel Room*

Wednesday, March 21st, 2012

The SSP Presidential Fruit Salad Symposia- something for everyone!

Presiding: Dr. Chris Hall, Dept. of Biology, Berry College, Mount Berry, GA
Dr. Vince Connors, University of South Carolina-Upstate, Spartanburg, SC

- 5:30- **Dr. Robert Sabatini.** Department of Biochemistry,
6:10 University of Georgia, Athens, GA “*Epigenetic regulation of transcription initiation and virulence in Trypanosoma cruzi by hypermodification of DNA*”
- 6:10- **Dr. George Benz,** Department of Biology, Middle
6:50 Tennessee State University, Murfreesboro, TN. “*Parasitic copepod research—shifting gears to confront basic knowledge voids.*”
- 6:50- **Dr. John Janovy.** Department of Biological Sciences,
7:30 University of Nebraska-Lincoln, Lincoln, NE. “*The importance of the unimportant.*”

‘A fruit salad is delicious precisely because each fruit maintains its own flavor.’ Sean Covey

Presidential Symposium Reception immediately following; 7:30- until whenever

Session I: Thursday Morning, March 22, 2012

Byrd-Dunn Student Paper Competition Southeastern Society of Parasitologists I

Location – Laurel

*Presenting Author

†Byrd-Dunn Student Paper Competitor

^ Ciordia-Stewart Porter Research Competitor

Session I Moderators: Allison Emmert and Paul Cosmann

- 8:30 1[†] ***MEADORS, WEATHERLY¹, STEVE A. ARNOTT², AND WILLIAM A. ROUMILLAT²**. ¹Grice Marine Lab, College of Charleston. ²SC Department of Natural Resources. Distribution and health assessment of red drum, *Sciaenops ocellatus*, exhibiting external lesions within South Carolina estuaries.
- 8:45 2[†] ***SALMON, ERIC, R.** Middle Tennessee State University, Murfreesboro, TN. Proposed study: Spatial distribution of *Eudactylina* sp. (Eudactylinidae: Siphonostomatoida: Copepoda) on gills of sand devils (*Squatina dumerili* Lesueur, 1818) in the Gulf of Mexico
- 9:00 3[†] ***HEIN JENNIFER¹, STEVE A. ARNOTT², WILLIAM A. ROUMILLAT² AND ISAURE DE BURON³**. ¹Master of Environmental Studies Program, College of Charleston. ²Marine Resources Research Institute, South Carolina Department of Natural Resources. ³Dept. of Biology, College of Charleston. Comparative impact of the invasive parasitic species, *Anguillicoloides crassus*, on the American eel populations of South Carolina estuaries.
- 9:15 4[†] ***SONDERMAN, KIM F.*1,2, TERRY M. NORTON^{3,4}, AND MICHAEL J. YABSLEY^{1,2}**. ¹Warnell School of Forestry and Natural Resources, University of Georgia, Athens, GA. ²College of Veterinary Medicine, Southeast Cooperative of Wildlife Disease Study, University of Georgia, Athens, GA. ³St. Catherine's Island Wildlife Survival Center, Midway, GA. ⁴Georgia Sea Turtle Center, Jekyll Island, GA.
Haemogregarine infections in a translocated population of gopher tortoises (*Gopherus polyphemus*).
- 9:30 5[†] ***WHITNEY M. KISTLER^{1, 2}, SAMANTHA E.J. GIBBS³, AND MICHAEL J. YABSLEY^{1, 2}**. ¹ Southeastern Cooperative Wildlife Disease Study, Department of Population Health, College of Veterinary Medicine, University of Georgia, Athens GA. ² Daniel B. Warnell School of Forestry and Natural Resources, University of Georgia, Athens GA. ³ Division of Migratory

Bird Management, United States Fish and Wildlife Service, Arlington, VA. Phylogenetic analysis of hematozoan parasites circulating in American black ducks (*Anas rubripes*).

- 9:45 6[†] * **GLEIM, ELIZABETH^{1,2,3}, MIKE CONNER², AND MICHAEL J. YABSLEY^{1,3}**. ¹Southeastern Cooperative Wildlife Disease Study, College of Veterinary Medicine, University of Georgia, Athens, Ga. ²Joseph W. Jones Ecological Research Center at Ichauway, Newton, Ga. ³Warnell School of Forestry and Natural Resources, University of Georgia, Athens, Ga. Challenges of surviving in a burned habitat: the effects of *Solenopsis invicta* (red imported fire ant) and habitat type on molt success and survival of *Amblyomma americanum* (lone star tick) and *Amblyomma maculatum* (Gulf coast tick).
- 10:00 7[†] ***SHOCK, BARBARA C^{1, 2}, BAMBI CLEMONS³, MARK W. CUNNINGHAM³, JOSEPH L. CORN², MICHAEL J. YABSLEY^{1, 2}**. ¹Warnell School of Forestry and Natural Resources, University of Georgia, Athens, GA. ²Southeastern Cooperative Wildlife Disease Study, Department of Population Health, College of Veterinary Medicine, University of Georgia, Athens, GA. ³Florida Fish and Wildlife Conservation Commission, Gainesville, FL. Ecology and formal description of a novel *Babesia* found in the endangered Florida puma (*Puma concolor coryi*).

Coffee Break 10:15 – 10:45

Session II

Moderators: Eric Salmon and Whitney Kistler

- 10:45 8[†] * **HOUK, ALICE E.¹, THOMAS O'CONNOR², HILDA F. J. PENNA³, SOLANGE MARIA GENNARI³, ANNE M. ZAJAC¹, and DAVID S. LINDSAY¹**. ¹Virginia Tech, Blacksburg, VA, ²IDEXX Corporation, Westbrook, ME, ³Universidade de São, Paulo, SP, Brazil. Experimental infection of dogs with a Brazilian isolate of *Cystoisospora canis*.
- 11:00 9[†] ***GOLTZ, LAUREN R., JEROME GODDARD, AND ANDREA VARELA-STOKES**. Mississippi State University, Starkville MS. Ecology and disease potential of the black-legged deer tick, *Ixodes scapularis* in Mississippi.

- 11:15 10[†] * **EDWARDS, JESSICA, F.¹, WENDY T. WATFORD¹, NICOLAS COLTEL², YVES CARLIER², ANGELA ELLIS¹, and MICHAEL J. YABSLEY¹.** ¹ College of Veterinary Medicine, The University of Georgia; ² School of Medicine, Universite Libre De Bruxelles. Primary infection of Balb/c mice with a United States *Trypanosoma cruzi* isolate results in altered immune response during a challenge inoculation.
- 11:30 11[†] * **COSMANN, PAUL J.¹, STEVE A. ARNOTT², WILLIAM A. ROUMILLAT², ALLAN E. STRAND¹, AND ISAURE DE BURON¹.** ¹Department Of Biology, College Of Charleston, Charleston, SC. ²Inshore Fisheries Division, South Carolina Department Of Natural Resources, Charleston, SC. Associations Between Parasite Burden And Health In Spotted Seatrout, *Cynoscion Nebulosus*.
- 11:45 12[^] * **FAZZONE, BRIAN J.¹, PAUL J. COSMANN², ISAURE DE BURON², WILLIAM A. ROUMILLAT³, AND VINCENT A. CONNORS¹.** ¹Department of Biology, University of South Carolina Upstate, Spartanburg, SC. ²Department of Biology, College of Charleston, Charleston, SC. ³Inshore Fisheries Division, Department of Natural Resources, Charleston, SC. Seatrout heart infection by *Cardicola* sp.: are small fish in more trouble?

12:00 p.m. – 1:30 p.m. Lunch Break

Thursday Afternoon, March 22, 2012 1:30 p.m. – 5:00 p.m.

**Byrd-Dunn Student Paper Competition
Southeastern Society of Parasitologists II**

Location – Laurel Room

*Presenting Author

†Byrd-Dunn Student Paper Competitor

^ Ciordia-Stewart-Porter Research Competitor

Session III: Moderators: Lauren Goltz and Alice Houk

- 1:30 16 ***^SIMMONS, ALYSHA¹, TACORA YEARGINS¹, ALICE E. HOUK¹, MERISCHIA GRIFFIN², REGINA JONES², KEVON STANFORD², SAMANTHA BARNES², DAVID SCOTT³, ALEXA C. ROSYPAL², AND DAVID S. LINDSAY¹.** ¹Virginia Tech, Blacksburg, VA, ²Johnson C. Smith University, Charlotte, NC, ³Carolina Raptor Rehabilitation Center, Huntersville, NC. Prevalence of encysted parasites in heart and breast muscle of raptors examined at necropsy at the North Carolina Raptor

Rehabilitation Center.

- 1:45 17 ***^RAYTCHEV, LUBEN V.¹, JESSICA L. GONYNOR-MCGUIRE¹, SEAN C. STERRET¹, JESSICA C. ABRAMS¹, JOHN C. WLODKOWSKI¹, LORA L. SMITH², AND MICHAEL J. YABSLEY¹.** ¹ Southeastern Cooperative Wildlife Disease Study, Department Of Forestry And Natural Resources University Of Georgia, Athens Ga. ²Joseph W. Jones Ecological Research Center, Newton Ga. Haemogregarines Of Freshwater Turtle Species: Does Basking Behavior Influence Parasitemia Levels?
- 2:00 18 ***^ADKINS, ZACHARY E.¹, ISAURE DE BURON¹, WILLIAM A. ROUMILLAT², AND ERIC J. McELROY¹.** ¹Department of Biology, College of Charleston, Charleston SC. ²South Carolina Department of Natural Resources, Charleston, SC. The effect of a parasite, *Kudoa inornata*, on the muscle material properties of spotted seatrout, *Cynoscion nebulosus*.
- 2:15 19 ***^EMMERT, ALISON, W.¹, TRAVIS W. BEELER¹, CHERYL ONWU¹, DEBBIE REED², and CHERYL D. DAVIS¹.** ¹Department of Biology, Western Kentucky University, Bowling Green, KY. ²Breathitt Veterinary Center, Murray State University, Hopkinsville, KY. Serological assessment of vector-borne disease risk in Kentucky canines.
- 2:30 20 ***^BEELER, TRAVIS W.¹, ALISON R. EMMERT¹, DEBBIE REED², and CHERYL D. DAVIS¹.** ¹Department of Biology, Western Kentucky University, Bowling Green, KY. ²Breathitt Veterinary Center, Murray State University, Hopkinsville, KY. Seroprevalence of *Trypanosoma cruzi* in dogs from western and central Kentucky.
- 2:45 21 ***^SMITH, WHITNEY E.¹, KELLI JONES², JOHN STOKES¹, JEROME GODDARD³, AND ANDREA VARELA-STOKES¹.** ¹Department of Basic Sciences, Mississippi State University, Mississippi State, MS. ²Poultry Research and Diagnostic Facility, Department of Pathobiology and Population Medicine, Mississippi State University, Mississippi State, MS. ³Department of Biochemistry, Molecular Biology, Entomology, and Plant Pathology, Mississippi State University, Mississippi State, MS. Identification of avian Haemosporidian parasites in the south- central United States.

Coffee Break 3:00 – 3:30

Session iV

Moderators: Elizabeth Gleim and Brian Fazzino

- 3:30 22 ***NAZIR, M. Mudasser¹, Azhar Maqbool¹, Alice E. Houk², DANA HAWLeY³, and David S. Lindsay².**
¹University of Veterinary and Animal Sciences Lahore, Pakistan, ²Department of Biomedical Sciences and Pathobiology, Virginia Tech, Blacksburg, VA, ³Department of Biology, Virginia Tech, Blacksburg, VA. High prevalence of *Toxoplasma gondii* in the muscles of house finches (*Carpodacus mexicanus*) collected in Alabama and Virginia
- 3:45 23 ***PALMIERI, JAMES R.¹ AND REBECCA J. PRICE².**
¹Department of Microbiology, Infectious, and Emerging Diseases, Edward Via College of Osteopathic Medicine, Blacksburg VA. ² Department of Biology, Virginia Polytechnic and State University, Blacksburg VA. Providing adequate Parasitology education to medical students in a time of shrinking class hours and curriculum: VCOM's response.
- 4:00 24 ***BURON, ISAURE DE ^{1*}, PATRICIA ROTH¹, DERK C. BERGQUIST², AND DAVID M. KNOTT².** ¹Department of Biology, College of Charleston, Charleston, SC. ²Marine Resources Research Institute, SC DNR, Charleston SC. *Mulinia lateralis* die-off: an opportunity to discover a novel vector for two cestodes.
- 4:15 25 ***ROSSER, THOMAS G.¹, MATT J. GRIFFIN^{1,2}, SYLVIE QUINIOU³, TERRENCE E. GREENWAY², LESTER H. KHOO^{1,2}, DAVID J. WISE², AND LINDA M. POTE¹.** ¹College of Veterinary Medicine, Mississippi State University, Mississippi State, MS. ²Thad Cochran National Warmwater Aquaculture Center, Mississippi State University, Stoneville, MS. ³Thad Cochran National Warmwater Aquaculture Center, USDA/ARS Catfish Genetics Research Unit, Stoneville, MS. A survey of myxozoan actinospores isolated from *Dero digitata* collected from commercial channel catfish ponds in the Mississippi Delta.
- 4:30 26 **CARLETON, RENEE** Department of Biology, Berry College.
Lethal multi-parasitic infection in a coyote (*Canis latrans*) from northwest Georgia

4:45 **Parasitology Teaching Workshop: Isaure DeBuron-**
– **Conners - Moderator**
5:15

Thursday sessions concluded.

Dinner?

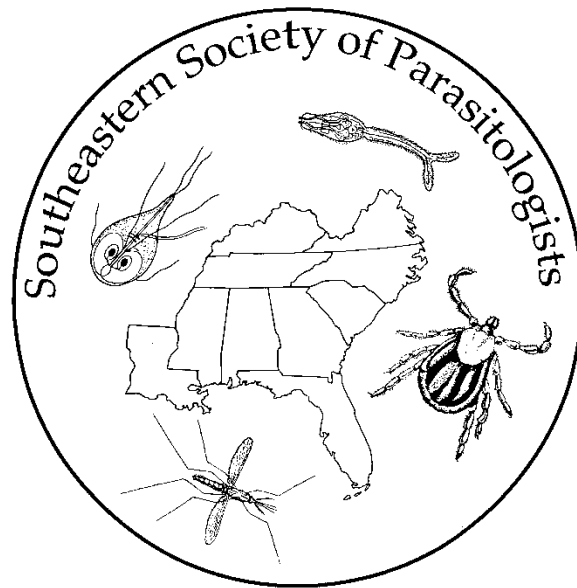
SSP Business Meeting/ Breakfast

Friday Morning, March 23, 2012 (8:00 a.m. - 10:30 a.m.)

Breakfast-8:00 a.m.

Business Meeting- 9:00 a.m.-10:30 a.m.

Location – TBA



PROGRAM ABSTRACTS

1. MEADORS, WEATHERLY¹, STEVE A. ARNOTT², AND WILLIAM A. ROUMILLAT².

¹Grice marine lab, college of Charleston. ²SC Department of Natural Resources. Distribution and Health Assessment of red drum, *sciaenops ocellatus*, exhibiting external lesions within South Carolina estuaries.

Over the last decade a high prevalence of severe skin lesions has been reported on red drum, *sciaenops ocellatus*, in winyah bay, south carolina primarily during the winter months. We suspect that skin lesions occur particularly in winyah bay and in the winter because this estuary is polluted and fish likely immunocompromised. However, a systematic study of all sc estuaries is necessary to determine spatial and temporal distributions of affected fish. Although the extent to which these lesions affect overall host health is unknown, studies on other fish species report a negative impact, particularly in contaminated habitats. The causative agent of the red drum lesions is unknown; identification is difficult due to the known association of multiple pathogens (e.g., endoparasites, bacteria, viruses) with fish skin lesions and a high degree of secondary infection by opportunistic organisms (e.g., ectoparasites, fungi, bacteria). This study aims to determine the spatial and temporal distribution of symptomatic red drum throughout sc estuaries. The presence and identity of causative pathogens will be explored by histological examination and by microbial culture of lesion biopsy samples. Hematology and blood chemistry are being used to assess general health and make comparisons between (i) condition of fish with and without lesions, (ii) fish captured in a contaminated location (winyah bay) vs. Fish from an uncontaminated location (ace basin), and (iii) fish caught in different seasons. Since august 2011 3.87% of 1550 red drum captured have exhibited lesions and 68.3% of these 61 individuals have been in winyah bay.

2. SALMON, ERIC, R. Middle Tennessee State University, Murfreesboro, TN. Proposed study: Spatial distribution of *Eudactylina* sp. (Eudactylinidae: Siphonostomatoida: Copepoda) on gills of sand devils (*Squatina dumerili* Lesueur, 1818) in the Gulf of Mexico

This presentation focuses on the distribution of siphonostomes infecting the gills of elasmobranchs and outlines my proposed master's thesis project. *Eudactylina* is currently comprised of 45 species that infect the gills of elasmobranchs and only one quantitative study of the site specificity of a *Eudactylina* sp. exists. Remarks have been made that *Eudactylina* spp. exhibit positive rheotaxis regarding the flow of water through their host's branchial field and observations I have made indicate that one species attaches to gill lamellae in the proximal region of gill filaments of sand devils. During my study I will use heads of 52 sand devils to investigate the following: 1) relationships between the number of gill filaments and gill lamellae per millimeter of gill filament as well as gill filament length and shark sex, shark size, body side of shark, hemibranch position, location about a hemibranch, and region along the longitudinal axis of a gill

filament, 2) relationships between copepod prevalence, abundance, and intensity and host sex, host size, body side of shark, hemibranch position, attachment location about a hemibranch, and attachment location regarding functionally distinct regions comprising a gill filament, 3) relationships between copepod body orientation relative to the theoretical flow of water over the gills at the parasite attachment site, and 4) relationships between the number of eggs per ovisac and copepod position. Fieldwork associated with this project was made possible through NSF funds awarded to Stephen A. Bullard and George W. Benz and through scholarship funds provided by MTSU.

3. HEIN JENNIFER¹, STEVE A. ARNOTT², WILLIAM A. ROUMILLAT² AND ISAURE DE BURON³. ¹Master of Environmental Studies Program, College of Charleston. ²Marine Resources Research Institute, South Carolina Department of Natural Resources. ³Dept. of Biology, College of Charleston. Comparative impact of the invasive parasitic species, *Anguillicoloides crassus*, on the American eel populations of South Carolina estuaries.

Reports of eel populations in South Carolina estuaries have shown a decline since at least 2001. The invasive parasite, *Anguillicoloides crassus*, infects the eel swimbladder and is considered one potential reason for this decline. This nematode is endemic to East Asia, where it infects the Japanese eel. It was first seen in the United States in 1995 and has since been reported along the Atlantic Coast however, we have no information regarding the status of infection and impacts of this parasite on eel populations in South Carolina. The goal of this project is to survey the presence and health effects of *A. crassus*, on American eel populations in two National Estuarine Research Reserves (NERR), the ACE and North Inlet NERRs and comparing them with more heavily developed areas of Winyah Bay and the Cooper River. Eels were collected for one full year to determine prevalence, intensities, and abundances of *A. crassus* at each site. The study will determine whether levels of *A. crassus* infection vary spatially and temporally, and whether infection levels vary between pristine and developed areas. Data show that 49%, 67%, 60%, and 61% of eels were infected in the ACE NERR, North Inlet NERR, Winyah Bay, and Cooper River respectively. Health indices and swimbladder damage were evaluated to determine whether infection by *A. crassus* is associated with any discernable effects on host health. The validity of using eel vent coloration as a noninvasive diagnostic tool of infection is tested. Funded by a SeaGrant/NERR: 2011 Coastal Research Fellowship Program

4. SONDERMAN, KIM F.*1,2, TERRY M. NORTON3,4, AND MICHAEL J. YABSLEY1,2.
1Warnell School of Forestry and Natural Resources, University of Georgia, Athens, GA.
2College of Veterinary Medicine, Southeast Cooperative of Wildlife Disease Study, University of Georgia, Athens, GA. 3St. Catherine's Island Wildlife Survival Center, Midway, GA. 4Georgia 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 a 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, tortoises 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 5 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.

5. WHITNEY M. KISTLER^{1,2}, SAMANTHA E.J. GIBBS³, AND MICHAEL J. YABSLEY^{1,2}. ¹ Southeastern Cooperative Wildlife Disease Study, Department of Population Health, College of Veterinary Medicine, University of Georgia, Athens GA. ² Daniel B. Warnell School of Forestry and Natural Resources, University of Georgia, Athens GA. ³ Division of Migratory Bird Management, United States Fish and Wildlife Service, Arlington, VA. Phylogenetic analysis of hematozoan parasites circulating in American black ducks (*Anas rubripes*).

Avian hematozoan parasites have a near worldwide distribution in birds. These parasites have been frequently identified in blood smears from dabbling ducks; however, molecular characterization of parasites from ducks is limited. For example, prevalence rates of hematozoa in the American black duck (*Anas rubripes*) is high (>20%), but none have been genetically characterized. To understand the phylogenetic relationships of parasites circulating in black ducks, we collected blood samples from 106 black ducks from January to March 2010 in four states, Connecticut (n=20), Maine (n=38), Maryland (n=43), and Rhode Island (n=5). Two polymerase chain reaction (PCR) assays were run for three hematozoan genera of interest. A total of 69 (65%) and 66 (62%) were positive for *Haemoproteus/Plasmodium* and *Leucocytozoon*, respectively. This high prevalence, outside the period of vector transmission, was interesting and suggests that parasitemias with these species are long-lasting. A subset of positive samples was sequenced. Our phylogenetic analysis of 41 *Haemoproteus*, 31 *Leucocytozoon*, and one *Plasmodium* detected two monophyletic groups of *Haemoproteus* and extensive genetic variation among the *Leucocytozoon*. One black duck *Haemoproteus* group included two other *Haemoproteus* spp. from waterfowl while the other group included a *Haemoproteus* from a Galapagos penguin. Despite extensive variation among the *Leucocytozoon* sequences, all grouped into three monophyletic groups with other *Leucocytozoon* spp. associated

with waterfowl and likely represent a single genetically-variable species. Two *Haemoproteus* species and one *Leucocytozoon* species from waterfowl have been described; so careful morphological analysis combined with molecular characterization is needed to determine if our groups represent these species.

6. GLEIM, ELIZABETH^{1,2,3}, MIKE CONNER², AND MICHAEL J. YABSLEY^{1,3}.
¹Southeastern Cooperative Wildlife Disease Study, College of Veterinary Medicine, University of Georgia, Athens, Ga.²Joseph W. Jones Ecological Research Center at Ichauway, Newton, Ga. ³Warnell School of Forestry and Natural Resources, University of Georgia, Athens, Ga. Challenges of surviving in a burned habitat: the effects of *Solenopsis invicta* (red imported fire ant) and habitat type on molt success and survival of *Amblyomma americanum* (lone star tick) and *Amblyomma maculatum* (Gulf coast tick).

Identifying ways in which humans can reduce tick populations will be important in preventing the spread and emergence of disease in the future. In a study determining the effects of long-term prescribed burning on ticks in Georgia, both a reduction in ticks as well as a shift in species composition was observed with the lone star tick (*Amblyomma americanum*) preferring unburned habitats and the Gulf coast tick (*A. maculatum*) preferring burned habitats. Interestingly, the red imported fire ant (*Solenopsis invicta*) is found predominantly in disturbed habitats, such as burned habitat, and several studies have reported that *A. americanum* is preyed upon by *S. invicta*. To better understand the drivers of tick population changes in burned habitat, the current study was conducted to evaluate the effects of *S. invicta* and habitat on survival of *A. americanum* and *A. maculatum*. Within treatments (burned habitat with ants, burned habitat without ants, and unburned habitat without ants), 10 tick enclosures were installed and seeded with engorged *A. americanum* and *A. maculatum* nymphs. Ticks were introduced during months of peak activity for that species. After molting, all ticks were collected. Survival of *A. americanum* in burned habitats (regardless of ant presence) was significantly lower compared with unburned habitat. *A. maculatum* had significantly higher survival in burned habitats (regardless of ant presence) compared to *A. americanum*. These results indicate that burning drives tick population dynamics, not *S. invicta*, with *A. maculatum* being better adapted to survive in burned habitat which experiences higher temperatures and lower humidity.

7. SHOCK, BARBARA C^{1,2}, BAMBI CLEMONS³, MARK W. CUNNINGHAM³, JOSEPH L. CORN², MICHAEL J. YABSLEY^{1,2}. ¹Warnell School of Forestry and Natural Resources, University of Georgia, Athens, GA. ²Southeastern Cooperative Wildlife Disease Study, Department of Population Health, College of Veterinary Medicine, University of Georgia, Athens, GA. ³Florida Fish and Wildlife Conservation Commission, Gainesville, FL. Ecology and formal description of a novel *Babesia* found in the endangered Florida puma (*Puma concolor coryi*).

The Florida puma (*Puma concolor coryi*) is an endangered subspecies of *Puma concolor* which has a remnant population (estimated 100-150) in southern Florida. In 2006, a novel *Babesia* species was detected in numerous Florida pumas. In the current study, we

provide new biological, serologic and molecular data on the *Babesia* species which will be used to formally describe the new species. Prevalence in adult pumas is high (>90%) and infected pumas have no evidence of anemia. Testing of over 900 bobcats from other parts of the US indicates that this *Babesia* is likely restricted to southern Florida and pumas, although screening of domestic cats from the region is pending. No evidence of congenital infection in kittens of *Babesia*-infected females was noted. Genetic analyses revealed high diversity in the ITS1 rRNA region, which suggests that the parasite is endemic in the Florida pumas. Serologic cross-reactivity (1:256) was noted between serum from *Babesia*-infected pumas and antigens of *B. odocoilei*, *B. canis*, and *B. bovis*. Ixodid ticks are known vectors for many *Babesia* species, but no vector has been identified for any felid *Babesia*. Ectoparasite surveys conducted for the past 18 years indicate that both *Dermacentor variabilis* (81% infested; Avg. 6 ticks/infested puma) and *Ixodes scapularis* (75% infested; Avg. 13 ticks) were common. Currently, studies are underway to determine if either of these two species are competent vectors. Although *Babesia* infections in wildlife are usually asymptomatic, catastrophic events such as viral outbreaks or severe stress may allow the parasite to become pathogenic.

8. HOUK, ALICE E.¹, THOMAS O'CONNOR², HILDA F. J. PENNA³, SOLANGE MARIA GENNARI³, ANNE M. ZAJAC¹, AND DAVID S. LINDSAY¹. ¹Virginia Tech, Blacksburg, VA, ²IDEXX Corporation, Westbrook, ME, ³Universidade de São, Paulo, SP, Brazil. Experimental infection of dogs with a Brazilian isolate of *Cystoisospora canis*.

We originally characterized the responses of beagle puppies to experimental inoculation with an isolate of *Cystoisospora canis* obtained from dogs from Blacksburg, Virginia. Our attempts to infect 2 beagle puppies with 50,000 sporulated *C. canis* oocysts of this isolate that had been stored at 4 C for 3 years were not successful. Therefore, we obtained oocysts of *C. canis* from a naturally infected dog from São Paulo, Brazil. Oocysts were sent to the Center for Molecular Medicine and Infectious Diseases, Blacksburg, Virginia. Oocysts were sporulated in 2% (v/v) sulfuric acid. Sporulated oocysts were concentrated by sugar flotation and 50,000 oocysts were fed to each of five 6 week-old female beagle puppies. The prepatent period was 9 (N=3) or 10 (N=2) days and the patent period was 7 (N=1), 8 (N=1) and 10 (N=3) days. Diarrhea was observed after 9 days in 2 dogs and was present in all dogs on day 10 PI. Feces were loose to normal appearing from these days up until day 17 PI when they became formed again in all dogs. Oocyst numbers in individual dogs peaked between 10 and 12 days post-inoculation. One dog was treated with Albon® (sulfadimethoxine) 12 days after inoculation due to severe bloody diarrhea. The size of oocysts collected from these dogs averaged 37.6 x 28.6 µm. After sporulation, oocysts contained 2 sporocysts each with 4 sporozoites. *Caryospora*-like oocysts were occasionally observed that contained 1 sporocyst with 8 sporozoites. This work was supported by a grant from IDEXX Corporation to DSL and AMZ.

9. GOLTZ, LAUREN R., JEROME GODDARD, AND ANDREA VARELA-STOKES. Mississippi State University, Starkville MS. Ecology and disease potential of the black-legged deer tick, *Ixodes scapularis* in Mississippi.

Ixodes scapularis Say is the prime vector for Lyme disease (*Borrelia burgdorferi*) in the eastern United States. To assess the seasonality and disease potential of this tick, we collected specimens weekly by corduroy drag cloth from two sites in Mississippi for one year (August 2010 – July 2011), with particular interest in the immatures. One collection site was located in north Mississippi near the Tennessee border at Wall Doxey state park in Holly Springs, and the other site at Noxubee National Wildlife Refuge in Starkville. Environmental data, consisting of temperature, sky condition, and relative humidity, were observed and recorded for each collection date. All ticks collected in the field were preserved in 95% ethanol and returned to the lab where they were counted, identified to species, and labeled. Both environmental data and temporal data are being analyzed with SAS statistical software to assess possible correlations between environmental conditions and the presence of *I. scapularis*. For disease potential studies, adult *I. scapularis* were macerated to extract DNA. Extracted DNA was frozen for further analysis and is currently being tested for the presence of *Borrelia burgdorferi*, *Anaplasma phagocytophilum*, and *Babesia* spp. using PCR.

10. EDWARDS, JESSICA, F. ¹, WENDY T. WATFORD¹, NICOLAS COLTEL², YVES CARLIER², ANGELA ELLIS¹, and MICHAEL J. YABSLEY¹. ¹ College of Veterinary Medicine, The University of Georgia; ² School of Medicine, Universite Libre De Bruxelles. Primary infection of Balb/c mice with a United States *Trypanosoma cruzi* isolate results in altered immune response during a challenge inoculation.

Trypanosoma cruzi, the causative agent of Chagas disease, is an important cause of morbidity and mortality for people and some animals. The current study was conducted to determine if previous inoculation of laboratory mice with a US *T. cruzi* isolate results in an altered immune response after a challenge inoculation. Groups of mice were inoculated with either a US strain (FLOPO3) or the Brazil strain. After 112 days, subsets of FLOPO3-inoculated mice were challenged with either Brazil or FLOPO3 and cytokine levels were determined at 0, 1, 7, 14, 21, and 28 days post infection/challenge. Mice were sacrificed at 28 DPI/DPC and inflammatory lesion scores were determined for heart and quadriceps tissue. In general, IFN- γ , IL-10, and IL-6 levels were highest in Brazil-infected mice compared with FLOPO3-infected mice. Mice challenged with the FLOPO3 strain produced lower levels of IFN- γ and TNF and higher levels of IL-4 compared with primary infection mice while Brazil-challenged mice produced lower levels of IFN- γ , IL-6, IL-10, IL-17a, and TNF compared with primary infected mice. Tissue inflammation in challenge mice was mild. Overall, our results indicate that previous inoculation with FLOPO3 and subsequently challenged with the Brazil strain results in lower pro-inflammatory cytokine levels and milder inflammation. NIH grant: R15 AI067304-02

11. COSMANN, PAUL J.¹, STEVE A. ARNOTT², WILLIAM A. ROUMILLAT², ALLAN E. STRAND¹, AND ISAURE de BURON¹. ¹Department of Biology, College of Charleston, Charleston, SC. ²Inshore Fisheries Division, South Carolina Department of Natural Resources, Charleston, SC. Associations between parasite burden and health in spotted seatrout, *Cynoscion nebulosus*.

Spotted seatrout are commonly infected by three species of parasites in South Carolina estuaries: the myxosporeans *Kudoa inornata* (in skeletal muscle) and *Henneguya cynoscioni* (in the bulbus arteriosus), and the digenean *Cardicola* sp. (in the ventricle). We hypothesized that these parasites negatively affect their host's health. To investigate this, we quantified the burden of each parasite species in wild-caught spotted seatrout over the course of one year using histology, and assessed host health in terms of body weight and liver weight (measures of energy storage), and spleen weight (a measure of immune response). The prevalence of infection was 91% for *K. inornata*, 29% for *H. cynoscioni*, and 86% for *Cardicola* sp., with 27% of fish being concomitantly infected by all three parasites ($N=117$). Using general linear models to control for the effects of body length, sex, and season, we found that *Cardicola* sp. was associated with reduced body weight and that *K. inornata* was associated with reduced liver weight. All three species were associated with changes in spleen weight, with *Cardicola* sp. being associated with enlarged spleens in all seasons, while the effect of *K. inornata* and *H. cynoscioni* on spleen weight depended on season. The decline in body and liver weights with increased parasite burden is interpreted as being due to the elevated energetic costs of resisting infection, whereas spleen enlargement is likely due to up-regulation of the immune system and/or increased hemopoiesis caused by infection by *Cardicola* sp. Funded in part by SeaGrant.

12. FAZZONE, BRIAN J.¹, PAUL J. COSMANN², ISAURE DE BURON², WILLIAM A. ROUMILLAT³, AND VINCENT A. CONNORS¹. ¹Department of Biology, University of South Carolina Upstate, Spartanburg, SC. ²Department of Biology, College of Charleston, Charleston, SC. ³Inshore Fisheries Division, Department of Natural Resources, Charleston, SC. Seatrout heart infection by *Cardicola* sp.: are small fish in more trouble?

Spotted seatrout, *Cynoscion nebulosus* (Cuvier, 1830), are important game fish in South Carolina estuaries and are thought to be negatively affected by parasites. In particular, seatrout in South Carolina are heavily infected with *Cardicola* sp., an aporocotylid trematode whose eggs often penetrate the heart ventricle and become encapsulated in granulomas that are thought to potentially lead to heart dysfunction. Because of high prevalence and parasite burden in adult fish, we hypothesized that infection in smaller fish would lead to a greater proportion of tissue damaged than in larger fish. Histological sections of spotted seatrout ventricle were taken from each specimen and three sections from each ventricle were chosen randomly and inspected for the presence of granulomas. All granulomas in a given field of view were counted in each section and the average calculated. The 10 largest [≥ 375 mm total length (TL)] and 10 smallest (≤ 325 mm TL) most infected fish were used for comparison of relative tissue damage. Two of the three sections of ventricle tissue were subsequently examined and six pictures were obtained at 400X magnification from each examined section. ImageJ software was used to analyze

percent of granulomatous tissue area per section as a measure of heart tissue damage. Preliminary analysis indicates that a higher percent of heart tissue is granulomatous in smaller infected fish than in larger infected fish.

13. SIMMONS, ALYSHA¹, TACORA YEARGINS¹, ALICE E. HOUK¹, MERISCHIA GRIFFIN², REGINA JONES², KEVON STANFORD², SAMANTHA BARNES², DAVID SCOTT³, ALEXA C. ROSYPAL², AND DAVID S. LINDSAY¹. ¹Virginia Tech, Blacksburg, VA, ²Johnson C. Smith University, Charlotte, NC, ³Carolina Raptor Rehabilitation Center, Huntersville, NC. Prevalence of encysted parasites in heart and breast muscle of raptors examined at necropsy at the North Carolina Raptor Rehabilitation Center.

Protozoal encephalitis is increasingly being reported in raptors from the United States. We examined the prevalence of encysted protozoan parasites in the muscles of raptors submitted to the North Carolina Raptor Rehabilitation Center, Huntersville, NC for treatment and rehabilitation. Birds that died or were humanely euthanased due to poor clinical prognosis were used in the present study. Portions of heart and breast muscle were examined using PCR primers for *Toxoplasma gondii*, *Neospora caninum*, *Sarcocystis neurona*/*S. falcatula*, and *Sarcocystis* species. Hematoxylin and eosin (H&E) stained tissue sections of heart and breast muscle were also examined microscopically for parasites. Our PCR studies are still being conducted. *Toxoplasma gondii* and *N. caninum* were not observed in H&E stained sections. Sarcocysts were seen in heart and breast muscle. Sarcocysts were microscopic. The genotypes of *T. gondii* present in the samples are currently being determined and the relationships of *Sarcocystis* species present in various raptors is being investigated using molecular methods. Supported in part by a Historically Black Universities and Colleges-Undergraduate Program (HBCU-UP) and Smith Institute for Applied Research grant to ACR and student training grants from the Virginia-North Carolina Alliance for Participation program at Virginia Tech to DSL.

14. RAYTCHEV, LUBEN V.¹, JESSICA L. GONYNOR-MCGUIRE¹, SEAN C. STERRET¹, JESSICA C. ABRAMS¹, JOHN C. WLODKOWSKI¹, LORA L. SMITH², AND MICHAEL J. YABSLEY¹. ¹ Southeastern Cooperative Wildlife Disease Study, Department of Forestry and Natural Resources University of Georgia, Athens GA. ² Joseph W. Jones Ecological Research Center, Newton GA. Haemogregarines of Freshwater Turtle Species: Does Basking Behavior Influence Parasitemia Levels?

Haemogregarines are intracellular blood parasites of freshwater turtles. These parasites are considered nonpathogenic and are transmitted by leeches. Although common, many aspects of the parasite-host relationship have yet to be elucidated. This project seeks to compare the parasitemias of haemogregarines among common species of freshwater turtles. We hypothesize that behavior (basking vs non-basking) will influence parasitemia levels with baskers having lower numbers of parasites. Turtles were trapped and bled at numerous locations in Georgia (Baker Co., in South Georgia and Clarke and Madison Cos., in North Georgia) and various ponds in Ingham Co., Michigan. In total, 90 turtles of 10 species from Georgia and 94 turtles of 5 species from Michigan were tested. Thin

blood smears were made, fixed in methanol, and stained with Giemsa. Smears were analyzed under a light microscope (100x) to determine 1) whether haemogregarine parasites were present and 2) the parasitemia level within each turtle (based on number of infected cells per 7,000 cells examined). To date, no differences were noted in the parasitemias detected in Georgia or Michigan turtles, in general ($p=0.338$), or by basking behavior (baskers, $p= 0.2766$; non-baskers, $p= 0.3382$). In contrast, significantly higher parasitemias were noted in non-baskers compared with baskers (Georgia and Michigan combined, $p<0.0001$; Georgia only, $p=0.004$; Michigan only, 0.003). These results indicate that basking behavior has a significant impact on the haemogregarine parasitemia levels in turtles. Currently it is unknown if basking reduces parasite burdens by limiting exposure to leeches or by increasing the immune response of the host.

15. ADKINS, ZACHARY E.¹, ISAURE DE BURON¹, WILLIAM A. ROUMILLAT², AND ERIC J. McELROY¹. ¹Department of Biology, College of Charleston, Charleston SC. ²South Carolina Department of Natural Resources, Charleston, SC. The effect of a parasite, *Kudoa inornata*, on the muscle material properties of spotted seatrout, *Cynoscion nebulosus*.

Spotted seatrout, *Cynoscion nebulosus*, is an important game fish in SC estuarine waters. Unofficial reports from fishermen say that the flesh of spotted seatrout is often soft or 'mushy' during warm months and thus unappealing; they also report that the unappealing texture worsens if the fish is not eaten very soon after capture. Concurrently, the presence of a myxosporean parasite, *Kudoa inornata*, has been observed in SC populations of the fish. One closely related *Kudoa* species is known to induce post-mortem myoliquefaction in other species of fish by secreting proteolytic enzymes. We investigated the effects of this parasitic infection on the flesh quality ('mushiness') of spotted seatrout by conducting compression tests and spore counts on muscle tissue from fillets of *C. nebulosus*. We expected that greater parasite intensity and greater time post-mortem (sample age) would alter the material properties of the muscle such as maximum stress, maximum strain, and Young's modulus of elasticity. We found that the sample age was not a statistically significant predictor of any mechanical property of the muscle samples but that the intensity of infection was a statistically significant predictor for maximum strain. As the intensity of infection increased the maximum strain decreased. We believe that this mechanical change due to parasitic infection plays a role in causing the unpleasant texture reported by fishermen.

16. EMMERT, ALISON, W.¹, TRAVIS W. BEELER¹, CHERYL ONWU¹, DEBBIE REED², and CHERYL D. DAVIS¹. ¹Department of Biology, Western Kentucky University, Bowling Green, KY. ²Breathitt Veterinary Center, Murray State University, Hopkinsville, KY. Serological assessment of vector-borne disease risk in Kentucky canines.

Canines serve as hosts for a wide variety of emerging and re-emerging vector-borne pathogens. Many of these pathogens can cause serious disease and even death in domestic dogs, and may also pose a significant zoonotic risk. Lyme disease in particular

is now the most common tick-borne disease of humans in the U.S.A., and one of the most common in dogs. A recent survey of ticks associated with raccoons and opossums in south central Kentucky showed that 25% were PCR positive for *Borrelia burgdorferi*. Nevertheless, surprisingly few studies have been conducted to determine the prevalence of vector-borne pathogens in canine populations in the U.S.A. In collaboration with the Breathitt Veterinary Lab in Hopkinsville, Kentucky, we have investigated the seroprevalence of four vector-borne pathogens: *Dirofilaria immitis* (canine heartworm), *Anaplasma phagocytophilum* (etiologic agent of anaplasmosis), *Borrelia burgdorferi* (etiologic agent of Lyme disease), and *Ehrlichia canis* (etiologic agent of canine ehrlichiosis) in dogs from western and central Kentucky. Sera from a total of 177 dogs were screened using SNAP 4Dx kits (Idexx Laboratories, Inc.). According to the manufacturer, the kit has a minimum of 98% specificity for all 4 pathogens. The results of our preliminary study revealed that 8/177 samples were positive for *E. canis* (4.5%), 8/177 were positive for *D. immitis* (4.5%), 1 was *A. phagocytophilum* positive (0.56%), and 1 was *B. burgdorferi* positive (0.56%). This project was supported in part by grants from the NCR (5P20RR016481-12) and the NIGMS (8 P20 GM103436-12) from the National Institutes of Health.

17. BEELER, TRAVIS W.¹, ALISON R. EMMERT¹, DEBBIE REED², and CHERYL D. DAVIS¹. ¹Department of Biology, Western Kentucky University, Bowling Green, KY. ²Breathitt Veterinary Center, Murray State University, Hopkinsville, KY. Seroprevalence of *Trypanosoma cruzi* in dogs from western and central Kentucky.

Previous studies from our laboratory showed a high prevalence of *Trypanosoma cruzi*, the etiological agent of Chagas' disease, in raccoons and opossums from Warren and Barren counties of Kentucky. These studies were the first to document the presence of *T. cruzi* in the state, however, a variety of studies have shown that the parasite is well established in mammal populations across the southern U.S.A. Canines are regarded as natural sentinels of transmission of *T. cruzi*, since seropositivity in an owner's dog suggests the presence of the Chagas' disease vector, *Triatoma spp.*, in or around the household. In collaboration with the Breathitt Lab of Murray State University, we have begun to investigate the prevalence of *T. cruzi* in Kentucky canines via serological assay and polymerase chain reaction. Canine Chagas Dipsticks (InBios International Inc., Seattle, Washington) were used to screen canine sera for the presence of anti-*T. cruzi* antibodies. According to Cardinal et al. (2006), this rapid dipstick test has a specificity of at least 94% and a sensitivity of at least 96%. A total of 249 samples were screened, and the results of this preliminary study revealed an overall seroprevalence of 17.1% for *T. cruzi*. Positive samples were obtained from 16/31 counties from the central and western region of Kentucky. The presence of *T. cruzi* DNA was confirmed in a subset of positive samples using nested PCR. This project was supported in part by grants from the NCR (5P20RR016481-12) and the NIGMS (8 P20 GM103436-12) from the National Institutes of Health.

18. SMITH, WHITNEY E.¹, KELLI JONES², JOHN STOKES¹, JEROME GODDARD³, AND ANDREA VARELA-STOKES¹. ¹Department of Basic Sciences, Mississippi State University, Mississippi State, MS. ²Poultry Research and Diagnostic Facility, Department of Pathobiology and Population Medicine, Mississippi State University, Mississippi State, MS. ³Department of Biochemistry, Molecular Biology, Entomology, and Plant Pathology, Mississippi State University, Mississippi State, MS. Identification of avian Haemosporidian parasites in the south-central United States.

In spring 2009, an outbreak of black flies in the south-central United States was linked to mortality in backyard poultry flocks. Some of the black fly specimens were collected, identified as *Simulium meridionale*, and deposited in the Mississippi Entomological Museum. *Leucocytozoon* spp. are protozoa transmitted by black flies that may be associated with disease in birds such as poultry. We investigated *Leucocytozoon* spp. as a cause of disease in this outbreak using PCR analysis and DNA sequencing of blood samples from affected birds and black flies. Diagnosis of *Leucocytozoon* spp. was complicated by co-infections with related haemosporidians (*Haemoproteus* spp. and *Plasmodium* spp.). Of 117 poultry blood samples collected, 32 (19%) were positive for *Leucocytozoon* spp. by blood smear analysis. Thirty of these samples were analyzed using PCR assays amplifying portions of the cytochrome b gene. One assay targeted all three haemosporidian genera and two were *Leucocytozoon*-specific. Despite inconsistent PCR results, likely due to molecular similarities among haemosporidians in co-infected samples, we were able to obtain DNA sequences from six birds. Amplicons from two chickens matched *Leucocytozoon* spp. sequences in GenBank, while amplicons from two other chickens and one turkey matched *Plasmodium* spp. All black flies were negative by PCR analysis. Thus, while there was some evidence of *Leucocytozoon* spp. in affected poultry, we cannot conclusively link this parasite with observed mortality using PCR and DNA sequencing. Current efforts are underway to enrich samples for *Leucocytozoon* spp. parasites and eliminate the presence of other haemosporidians using flow cytometry and cell sorting.

19. NAZIR, M. Mudasser¹, Azhar Maqbool¹, Alice E. Houk², DANA HAWLEY³, and David S. Lindsay². ¹University of Veterinary and Animal Sciences Lahore, Pakistan, ²Department of Biomedical Sciences and Pathobiology, Virginia Tech, Blacksburg, VA, ³Department of Biology, Virginia Tech, Blacksburg, VA. High prevalence of *Toxoplasma gondii* in the muscles of house finches (*Carpodacus mexicanus*) collected in Alabama and Virginia

Little is known about prevalence of protozoan parasites in the muscles of house finches (*Carpodacus mexicanus*). The muscles from 18 (heart and breast from 15 and breast only from 3) house finches were examined for the DNA of *Toxoplasma gondii*, *Neospora caninum*, *Sarcocystis neurona*/*S. falcatula* and *Sarcocystis* species using PCR. Eight were female and 10 were males. The birds were part of a research project on the effects of infection with the naturally occurring bacterium *Mycoplasma gallisepticum* in house finches. Birds were collected in the wild then housed at the aviary of the Biology Department Virginia Tech. Birds that died or were euthanized due to poor health were submitted for necropsy at the Center for Molecular Medicine and Infectious Diseases, Virginia Tech where DNA isolations and PCR was conducted. Thirteen (72%) of the

birds were positive for *T. gondii*. Heart and breast tissue were both always positive for *T. gondii* in the same bird. Three (16%) of the finches were positive for *N. caninum*. The distribution of *N. caninum* DNA was more variable in the muscles of house finches and was found in the heart only of 1, heart and breast muscle of 1, and the breast muscle only of 1 finch. No birds were positive for *Sarcocystis* species DNA in their muscles. The genotypes of the *T. gondii* isolates are presently being determined to investigate the role of house finches in the epidemiology of pathogenic genotypes of *T. gondii*. The high prevalence of *T. gondii* in house finches and their predation on by cats suggests that they may play an unrecognized role in maintaining environmental contamination with *T. gondii* oocysts by cats. The contribution of DH was supported in part by NSF IOS-1054675 and EF-0622705. The contribution of M. Mudasser Nazir was supported by a grant from the Higher Education Commission of Pakistan to DSL.

20. PALMIERI, JAMES R.¹ AND REBECCA J. PRICE². ¹Department of Microbiology, Infectious, and Emerging Diseases, Edward Via College of Osteopathic Medicine, Blacksburg VA.² Department of Biology, Virginia Polytechnic and State University, Blacksburg VA. Providing adequate Parasitology education to medical students in a time of shrinking class hours and curriculum: VCOM's response.

Traditionally, parasitology education in medical consisted of didactic presentation and wet laboratory experiences. In a recent 30 question national survey conducted among 64 medical schools (M.D. and D.O. degrees) results demonstrated a five to ten year trend of decreased microbiology and parasitology student contact hours. There is a national trend toward the elimination of wet laboratory experiences within microbiology and parasitology curricula. Some medical and graduate schools are replacing traditional parasitology laboratory experiences with software simulations while other schools have eliminated laboratory experiences from their curriculum. There is also a national trend to reduce the number of classroom hours within microbiology and parasitology curricula. Over the past ten years, many departments of microbiology have been eliminated, often combining with departments of immunology or biochemistry. At the Edward Via College of Osteopathic Medicine, we have expanded the teaching of microbiology and parasitology for both the first and the second year students. Our medical students receive 45 hours of microbiology which includes 10 hours of parasitology. In addition, first year students participate in a three hour diagnostic wet laboratory experience while second year students receive an eight hour diagnostic wet laboratory program. It is critical to review the current national trend of the decreasing parasitology curriculum in both graduate and medical schools. National and regional societies of parasitology must address this issue and reverse this national trend. Ignoring it will have impact on veterinary, medical, and graduate school curricula as well as funded research in Parasitology.

21. BURON, ISAURE DE ^{1*}, PATRICIA ROTH¹, DERK C. BERGQUIST², AND DAVID M. KNOTT². ¹Department of Biology, College of Charleston, Charleston, SC. ²Marine Resources Research Institute, SC DNR, Charleston SC. *Mulinia lateralis* die-off: an opportunity to discover a novel vector for two cestodes.

Unexplained mass mortality events of the dwarf surf clam, *Mulinia lateralis*, have been reported on the southeastern US Atlantic coast and in the Gulf of Mexico for decades, with one such occurrence in South Carolina during the summer of 2010. As general environmental conditions (temperature, oxygen, salinity, etc.) were not unusual, parasitic infection was suggested as a possible mechanism for the event. A sample of live clams that were stranded on the beach was collected, of which 200 were measured and dissected. Two types of cestode larvae were found: plerocercoids occupied the digestive gland canals and merocercoids were free beneath the mantle. Species were identified as *Duplicibothrium cf. minutum* (plerocercoids) and *Rhodobothrium paucitesticulare* (merocercoids) via sequencing of the 28S rRNA gene. Cownose rays, *Rhinoptera bonasus*, are known definitive hosts for these two tapeworm species and heavy feeders of *Mulinia lateralis*. Of the 200 clams, 2.1% were infected with merocercoids (mean intensity 1.25 ± 0.17) and 75% with plerocercoids (mean intensity 4.3 ± 3.7). Probability of infection by plerocercoids increased significantly with individual shell length. Because smaller and uninfected clams were abundant among the stranded animals, these parasites are not considered to be the causative agent of the die-off and we hypothesize that the population of *M. lateralis* went through a natural boom and crash cycle.

22. ROSSER, THOMAS G.¹, MATT J. GRIFFIN^{1,2}, SYLVIE QUINIOU³, TERRENCE E. GREENWAY², LESTER H. KHOO^{1,2}, DAVID J. WISE², AND LINDA M. POTE¹. ¹College of Veterinary Medicine, Mississippi State University, Mississippi State, MS. ²Thad Cochran National Warmwater Aquaculture Center, Mississippi State University, Stoneville, MS. ³Thad Cochran National Warmwater Aquaculture Center, USDA/ARS Catfish Genetics Research Unit, Stoneville, MS. A survey of myxozoan actinospores isolated from *Dero digitata* collected from commercial channel catfish ponds in the Mississippi Delta.

The Phylum Myxozoa contains numerous parasitic species of economic importance, especially in the aquaculture industry. Myxozoans are primarily parasites of fish, with a two host life cycle consisting of the fish stage (myxospores) and an aquatic oligochaete stage (actinospores). Recently collapsed into a single taxonomic group, these two different stages in the myxozoan life cycle were once considered to be different organisms separated into two taxonomic classes, Myxosporea (in the fish host) and Actinosporea (in the oligochaete host). Elucidation of several of the myxozoan life cycles has been made possible using molecular techniques to identify both the actinospore and myxospore stages. One myxozoan of importance in the commercial catfish is *Henneguya ictaluri*, the etiologic agent of Proliferative Gill Disease (PGD), which is often associated with high fish mortalities. While all of the life cycle stages of *H. ictaluri* have been molecularly confirmed, there are other myxozoan actinospores in

commercial catfish ponds that need to be characterized and their myxospore stages identified. To achieve this, a recent survey of commercial catfish ponds was done and seven different actinospore morphotypes were isolated from infected *Dero digitata*. They were characterized by both morphometric analysis and sequencing of the small subunit ribosomal RNA (SSU rRNA) gene. Typical *Henneguya* spp. cysts (containing myxospores) were also collected from commercial catfish ponds. The morphometric and molecular data generated on these actinospores and myxospores will be used to study the phylogeny of the *Henneguya* and complete many of these

NOTES

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