

SEEC

The 5th Annual
Southeastern Ecology and Evolution Conference
Florida State University

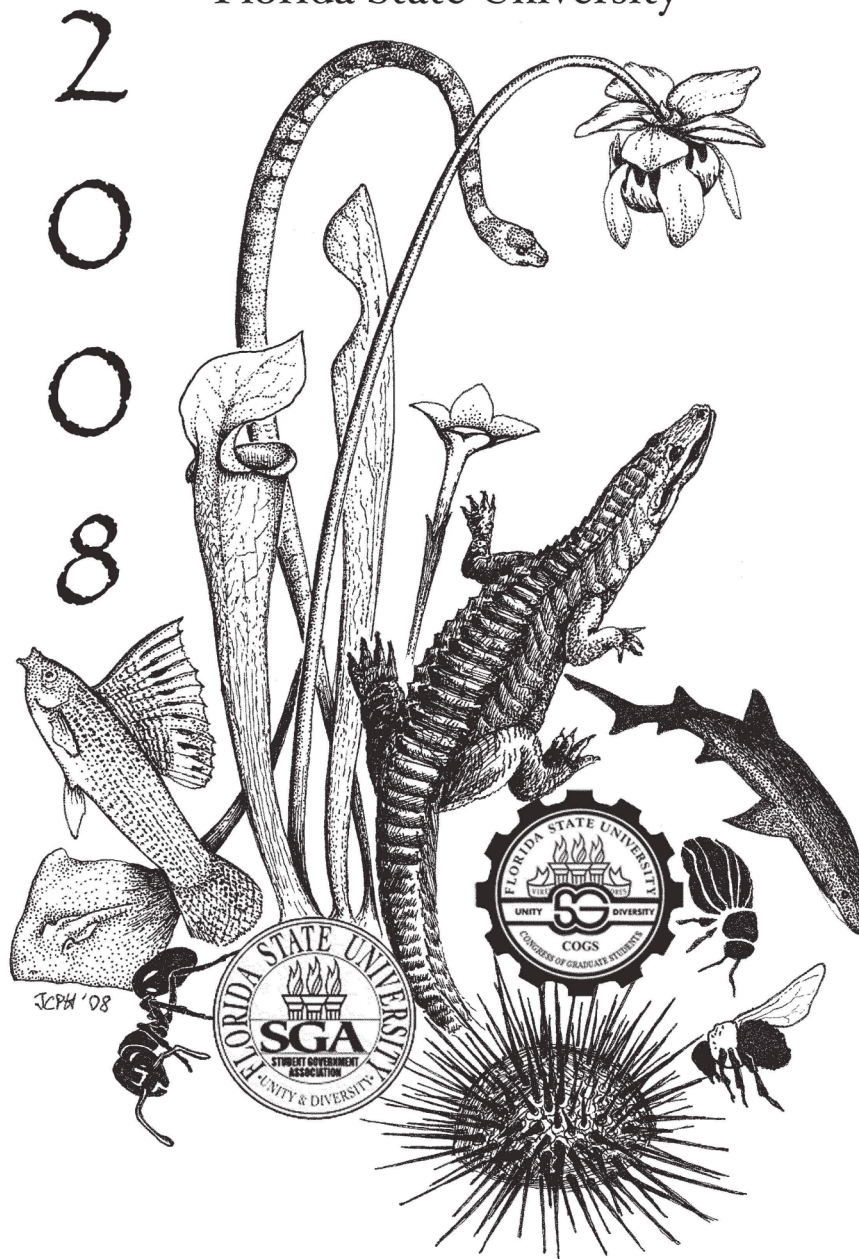


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Welcome to the 5th annual Southeastern Ecology and Evolution Conference,
28–30 March 2008,
at Florida State University

Special thanks go to

Dani Su Armstrong and **Sonja Ardoin** (Assistant Directors, Student Activities Center) for helping us to get the conference off the ground

Debra A. Fadool and **Michael Meredith** for help with the early stages of planning and for donated poster stands
Jo-Ann Falcon (Administrative Assistant to the Chairman; Department of Biological Science, FSU) for helping to manage funds raised within the department and the college.

Jean Hancock (Coordinator, Academic Programs, FSU), for providing us with the SEEC logo.

Anne B. Thistle (Scientific Research Specialist), for organizing and formatting the SEEC 2008 program.

Joseph Travis and **Walter R. Tschinkel** (Professors, Department of Biological Science, FSU), for providing us with eminent speakers for SEEC 2008.

The organizing committee of the 2007 SEEC meetings at the University of Central Florida for helping us get started planning SEEC 2008

Andres Plata Stapper for his wonderful artwork

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Ecology and Evolution Research and Discussion Group
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Biographical sketch

Joseph Travis

(Plenary lecture, 28 March 2008)

Joseph Travis is a Robert O. Lawton Distinguished Professor of Biological Science at Florida State University and Dean of the FSU College of Arts & Sciences. He received his undergraduate degree from the University of Pennsylvania and his doctoral degree from Duke University. Travis joined the faculty in Biological Science at Florida State in 1980 and rose through the faculty ranks, serving as chairman of the Department of Biological Science from 1991 through 1997 and as Director of the Program in Computational Science from 2000 through 2005.

Travis' research has been concentrated at the intersection of ecology and evolutionary biology, focused particularly on how ecological forces act as agents of natural selection on life histories. His early work investigated how predators, crowding, and environmental uncertainty selected for patterns of growth and development in larval amphibians. Subsequent work focused on how several selective agents—thermal regime, salinity, predators, and mating preferences—acted in different combinations in different populations to maintain striking local differences among populations in the morphology, life history, and reproductive characters of a livebearing fish, the sailfin molly (*Poecilia latipinna*). The chief subject of his present research is how different patterns of numerical dynamics in local populations exert different selective pressures on the life history and mating behavior of the least killifish, *Heterandria *irmosa**.

All of this research has balanced ecological with genetic components. The recent work with least killifish populations has included ecological studies of comparative numerical dynamics, predator-prey interactions, and trophic structure; it has also included genetic analyses of population structure, paternity patterns in natural populations, and quantitative characters. Students from the Travis lab have worked on a variety of topics from species interactions in Amazonian frogs to the genetic and environmental controls of color pattern and retinal characteristics of bluefin killifish. The National Science Foundation has supported Travis' research since 1981, and awards from the NSF have helped train 20 doctoral students (14 completed dissertations, six current students) and eight masters' degree students and provided stipend support for nearly 100 graduate and undergraduate students since 1981. His current research is supported by an award from the National Science Foundation and an award from the Alabama Wildlife Commission.

Travis has served on the editorial boards of *Journal of Evolutionary Biology*, *Oecologia*, *Annual Review of Ecology and Systematics*, and *The American Naturalist*. He served as editor of *The American Naturalist* from 1998 to 2002 and as Vice-President (1994) and President (2005) of the American Society of Naturalists. In 1991, he was elected a Fellow of the American Association for the Advancement of Science. Travis has served on several program advisory panels for the National Science Foundation: Population Biology, Research Experiences for Undergraduates—Sites, and Undergraduate Mentorships in Environmental Biology. He is currently serving on the Advisory Council for the Directorate in Biological Sciences and the cross-directorate Advisory Council for Environmental Research and Education, which reports to NSF Director Arden Bement. From 1999 through 2002, he served on the Scientific Advisory Board of the National Center for Ecological Analysis and Synthesis, chairing the board in 2001–2002. He has served on several external review panels for biology departments at various universities and continues to serve the National Marine Fisheries Service as a member of the Recovery Science Review Panel for Pacific Salmon.

Biographical sketch

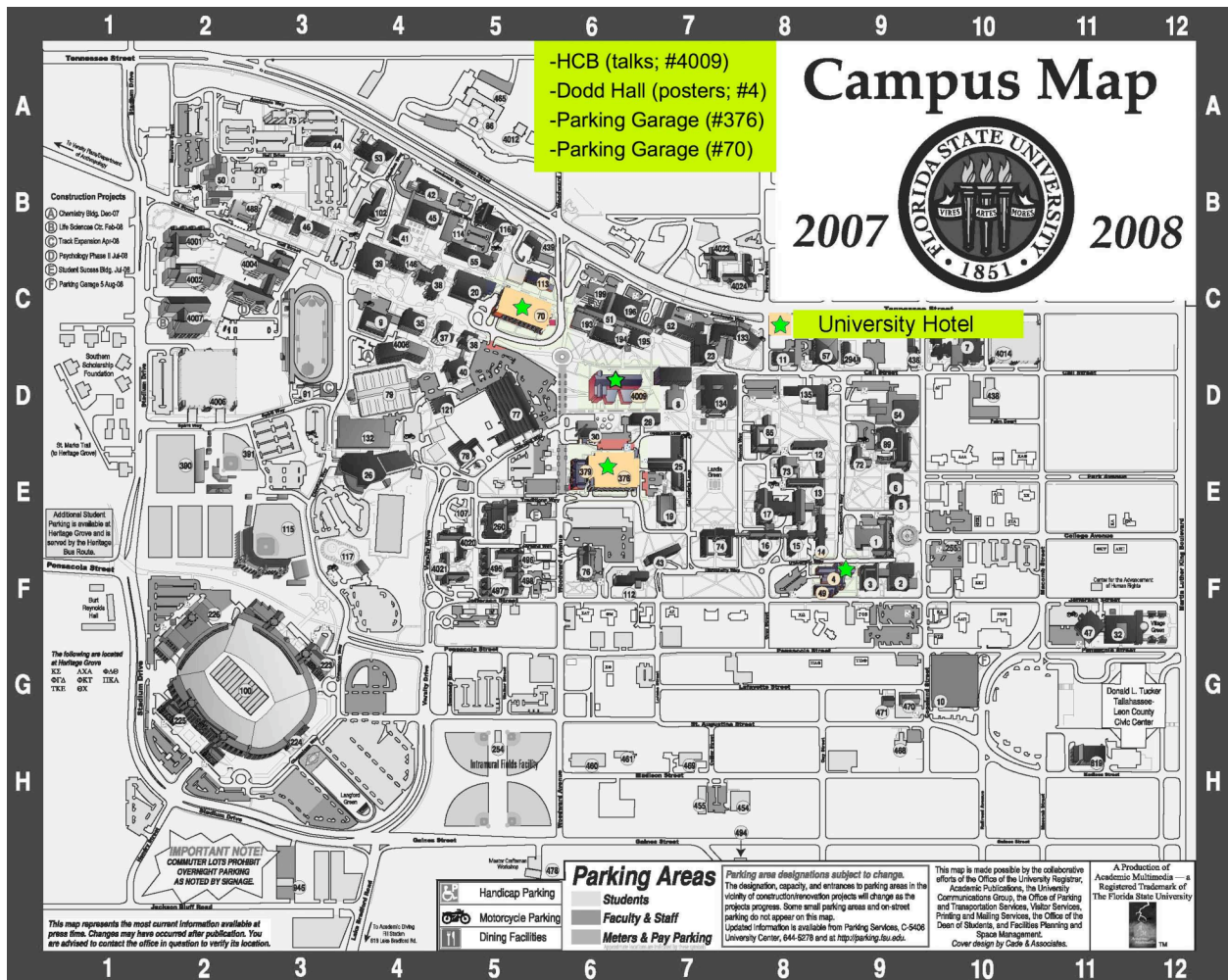
Walter R. Tschinkel

(Concluding remarks, 30 March 2008)

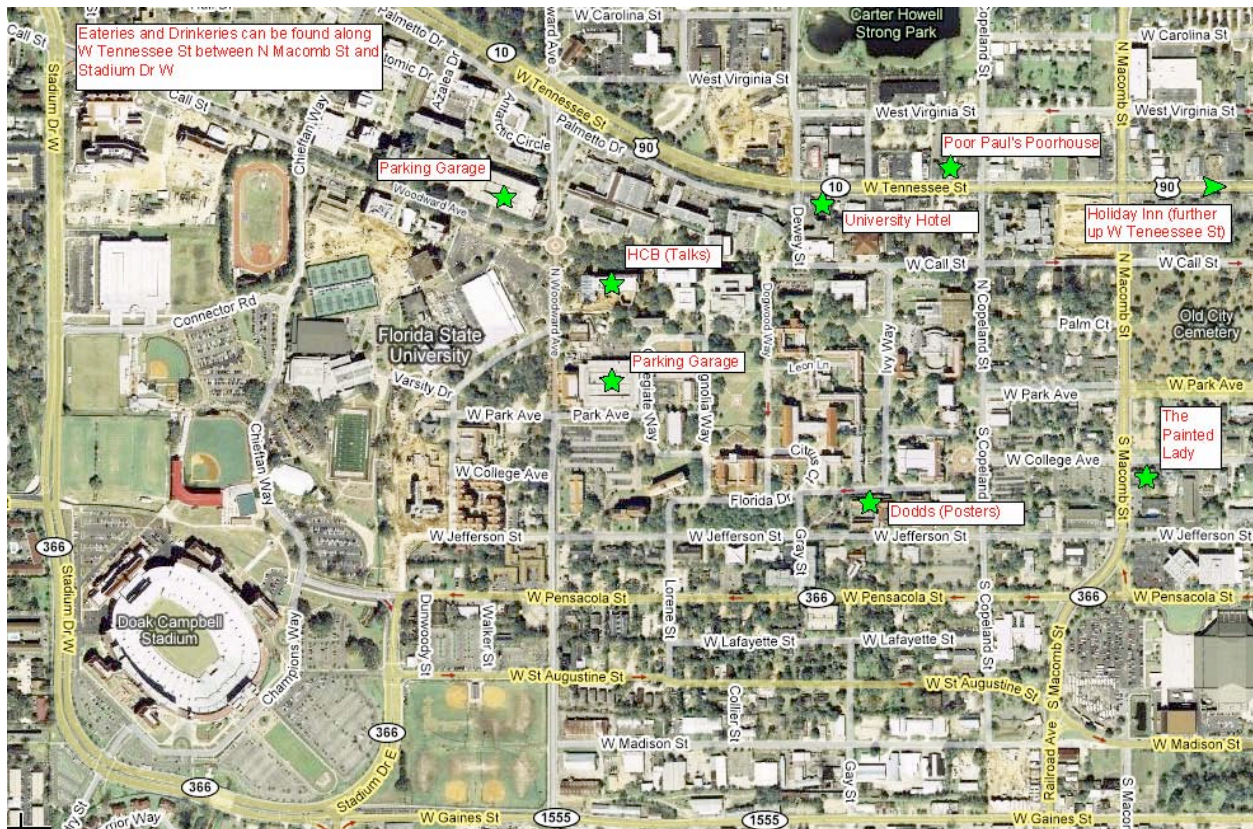
As a kid, Walter Tschinkel was considered a little weird because he liked bugs and stuff and looked at pond slime through his microscope. The suspicions of society were confirmed when he grew up into a weird adult. Like many lucky biologists, he never outgrew his youthful interests, but turned them into his profession instead.

Born in wartime in the Sudeten-German area of Czechoslovakia, he grew up in Texas, Alabama, and Connecticut before attending Wesleyan, a small men's college for small men. Graduate school took him to the University of California at Berkeley, where, between picketing, pottery, backpacking, photography, and getting married, he earned an M.S. and a Ph.D. in comparative biochemistry (whatever that is) with a focus on chemical communication in beetles. Upon finishing his Ph.D., he packed his new wife and 5 pounds of halvah into his '46 Ford V-8 convertible and headed for a postdoctoral stint at Cornell. After a year of teaching at Rhodes University in South Africa, he finally came permanently to roost at Florida State University, where he is currently a R. O. Lawton Distinguished Professor and the Menzel Professor of Biological Science. Thirty-seven years of research on diverse aspects of the social biology of fire ants and other ants has allowed him to pretend to know something about these fascinating creatures and their ways. The Big Questions that Walter is trying to answer through his research are, How do the thousands of ants that make up a colony manage to function as a single entity, a superorganism? How do colonies of fire ants interact on an ecological scale? He recently published the definitive book on fire ant social biology. In 2001, he traveled to the Antarctic only to discover that the only ants there were in the name.

Walter's wife and daughter are both smarter than he is, but he is quite a bit stronger. He is one of the few people who can do body-flanges (push-ups with arms fully extended forward), and holds the record for the number of Sunray Venus Clams dug in a single breath-hold dive. Rather late in life, he discovered that he enjoyed digging holes, a pleasure that suited his growing interest in ant nest architecture. In one hour, he can dig a six-foot hole wide enough to swing a shovel in. Outside of science, Walter is an accomplished woodworker and makes both furniture and gadgets for his research. A world-class scrounge, he has paid for very little of the lumber he uses and can spot a scroungable cherry tree from over a quarter of a mile away. He is also an accomplished photographer and artist and has exhibited in galleries in California, Vermont, Minnesota, Connecticut, and Oregon, as well as in his own office and hallway.



Florida State University Map



Florida State Satellite Map

Meeting Schedule

Location: HBC Classroom Building, Florida State University

Friday, March 28, 2008

5:00–7:00 p.m.: Registration (HCB) and poster set-up (Dodd Hall), HCB

7:00 p.m.: Plenary lecture by Dr. Joseph Travis (102 HBC), followed by informal social

Saturday, March 29, 2008

8:00 a.m.: Breakfast (provided at HCB)

9:00 a.m.–12:15 p.m.: Oral Presentations

12:15 p.m.–1:15 p.m.: Lunch (provided)

1:15 p.m.–5:00 p.m.: Oral presentations

5:30 p.m.–7:30 p.m.: Poster session and happy hour (Werkmeister; Dodd Hall)

8:00 p.m.: Dinner (provided), followed by raffle and informal social at the Painted Lady

Sunday, March 20, 2008

10:00 a.m.: Breakfast (provided HCB)

11:00 a.m.: Concluding remarks, Dr. Walter R. Tschinkel (102 HCB), and awards for best talk and poster

Afternoon: Field trip to see some awesome local flora and fauna. Three options are available; see following page.

FIELD TRIP OPTIONS

OPTION 1: WAKULLA RIVER CANOE TRIP

Leave FSU at 12:30 p.m.; return to FSU about 5:30 p.m.

Begin at T-n-T Hideaway Canoe rental (<http://tnthideaway.com/>) for approximately a 3.5-hour trip.

The Wakulla River is spring fed and emerges from under ground at the Wakulla Springs State Park; the trip is 6 miles of slow-moving easy paddling. Wildlife is abundant along the banks, and the pristine water is excellent for viewing the underwater grasses, fishes, snails, turtles, and manatees. Dress appropriately.

All prices quoted are for 4-hour rental, equipment and sales tax included.

Canoes: 2 person per canoe, \$25; 3 person per canoe, \$30

Kayaks: Single sit in or sit on top, \$20; single fishing kayak, \$20;
tandem sit in or sit on top, \$30

OPTION 2: HERPING TRIP

Leave FSU at 12:30 p.m., return to FSU about 6:00 p.m.

Either of two destinations is possible, depending on weather and/or a vote of the participants.

1. Snake Trip (warm sunny weather), St. Marks National Wildlife Refuge.

We'll hike the Florida Scenic Trail and observe the herpetofauna of the coastal slash pine flatwoods. Common species are four species of watersnake, cottonmouth, pigmy rattlesnakes, racers, bluestripe garter snakes, bluestripe ribbon snakes, and scarlet kingsnakes. If we get lucky, we'll see an eastern kingsnake or eastern diamondback rattlesnake. Of course, alligators and an assortment of basking turtles are guaranteed. Dress appropriately.

2. Amphibian Trip (cool or wet weather), The Nature Conservancy's Garden of Eden and the Apalachicola National Forest.

We'll hike the steephead ravines and flip logs for stream dwelling salamanders. We'll then take the dipnets to the national forest to look for *Siren*, *Amphiuma*, and *Necturus*. Dress appropriately.

OPTION 3: MARINE LAB TRIP

Leave FSU at 12:30 p.m.; return to FSU by about 5:30 p.m.

We will head down to the Florida State Coastal and Marine Laboratory at Turkey Point to explore the facility and some of the coastal environments. Activities may include nearshore wading and a flat-top boat trip and possibly sea-grass trawling for local fauna. Please wear clothes that you don't mind getting wet.

Saturday, March 29			
	Room: HCB 205	Room: HCB 208	Room: HCB 207
	Ecology	Systematics, Molecular Biology, Functional Morphology, and Evolution	Microbial Ecology, Animal Behavior, and Conservation
9:00–9:15 am	Kowal, Virginia A. The effect of sampling effort on species richness estimates of flower visitors	Bagley, Justin C., and Phillip M. Harris. Taxonomy, population genetics, and body shape variation of Alabama spotted bass <i>Micropterus punctulatus henshali</i>	Green, Stefan J., David F. Blake, and Jennifer G. Blank. A novel microbial mat developing in ophiolite-hosted moderately alkaline springwater
9:15–9:30 am	Smiley, Sarah A., Earl McCoy, and Henry Mushinsky. Prospecting for gold: sampling problems, habitat, and population dynamics of golden mice (<i>Ochrotomys nuttalli</i>) in south-central Florida	Doffitt, Chris, Lisa Wallace, and Gary N. Ervin. Phylogenetic relationships of the genus <i>Amsonia</i> (Apocynaceae) in North America based on trnH-psbA and trnD-trnT sequence data	Akob, Denise M., Lee Kerkhof, Anthony Palumbo, Kirsten Kuesel, and Joel E. Kostka. Determination of the metabolically active microbial groups in subsurface sediments with a high potential for U(VI) bioremediation
9:30–9:45 am	Luhring, Thomas M. Population ecology of greater siren	Metzger, Genevieve, Fred Kraus, and Christopher Parkinson. Historical biogeography of the New Guinea crowned snakes (Elapidae: <i>Aspidomorphus</i>)	
9:45–10:00 am	Davenport, Jon M., and David R. Chalcraft. Influences of alternative prey on interactions among intraguild predators	Chabarria, Ryan E., Brian I. Crother, Mary E. White, and Henry Bart. The phylogeography of <i>Necturus beyeri</i> in the southeastern United States	
10:00–10:15 am	McNutt, David W., and Amber L. Lefstead. The indirect, plant-mediated interaction between two specialist herbivores varies among host plant genotypes	Fenwick, Allyson. Meta-analysis and phylogenetics: the Great American Biotic Interchange as a case study	
10:15–10:45 am	Break		
10:45–11:00 am	Lotterhos, K. E. Using dynamic regression models to estimate the relative role of competition and environmental forcing in the recruit abundances of Pacific coast rockfish	Havird, Justin C., and Larry M. Page. Systematics of the <i>Lepidocephalichthys</i> complex and evolution of sexual dimorphism in loaches	Adreani, Mia. Context-dependent streak spawning in the hermaphroditic seabass <i>Serranus subligarius</i>
11:00–11:15 am	Miller, Mary-Elizabeth C., and William M. Graham. The influence of ecological and physical factors on the settlement and survivorship of the moon jelly (Scyphozoa; <i>Aurelia</i> sp.) in the northern Gulf of Mexico	Swain, Timothy D. Phylogeny-based species delimitations: novel alignment of hypervariable nucleotide sequences results in phylogenies concordant with morphology	Manjerovic, Mary Beth, and Jane M. Waterman. Trade-offs of reproductive quality and immunity in a highly promiscuous species

	Room: HCB 205	Room: HCB 208	Room: HCB 207
	Ecology	Systematics, Molecular Biology, Functional Morphology, and Evolution	Microbial Ecology, Animal Behavior, and Conservation
11:15–11:30 am	Belford, Stanton. Analysis of coral distribution and coral symbionts in two reef "systems" in the southern Caribbean	Cushman, E., N. Jue, A. Strand, and E. Sotka. Is there a genetic basis for the current separation between Gulf of Mexico and Atlantic stocks of the gag grouper (<i>Mycteroperca microlepis</i>)?	McGhee, Katie E. The stability of male dominance status in the bluefin killifish
11:30–11:45 am	Kimble, S. J. A., and R. W. Thacker. Phylogenetic and taxonomic distinctness of populations of Caribbean mangrove root sponge species	Kocot, Kevin M., and Scott R. Santos. Secondary structural modeling of the second internal transcribed spacer (ITS2) from <i>Pfiesteria</i>-like dinoflagellates (Dinophyceae)	Dagg, Kendra. Acoustic defense against eavesdropping in duetting katydids, genus <i>Amblycorypha</i> (Orthoptera: Phaneropterinae)
11:45–12:00 pm	Raut, Samiksha, and Robert Angus. Anal fin masculinization and vitellogenin inhibition as biomarkers of endocrine disruption in female mosquitofish, <i>Gambusia affinis</i>	Coffey, Peter. The effects of gape distance on the crushing force of crayfish chelae (<i>Cambarus bartonii</i>)	Kovacs, Jennifer L., and Michael A. D. Goodisman. I will survive: what factors influence hibernation survival in social wasp queens?
12:00–12:15 pm	Petes, Laura E., and Alicia J. Brown. Effects of salinity on <i>Apalachicola</i> oyster disease	Prieto-Márquez, Albert, Paul Gignac, Shantanu Joshi, and Gregory M. Erickson. Testing the utility of osteological correlates purported to reflect sex in non-avian dinosaurs	McGregor, Anna E., Douglas Nowacek, Carolyn Angell, Michael Moore. Is it a long way down? North Atlantic right whales (<i>Eubalaena glacialis</i>) change their behavior in response to increased buoyancy
12:15–1:15 pm	Lunch		
1:15–1:30 pm	Jones, Estelle, and Kimberly Bohn. Control methods for the invasive Japanese climbing fern in natural areas of northwest Florida and implications to nontarget forest plants	Fierst, Janna L., and Thomas F. Hansen. Genetic architecture in reproductive isolation	Jue, Nathaniel, Thierry Brule, Chris Koenig, and Felicia Coleman. Shelf to shelf? Gene connectivity of gag, <i>Mycteroperca microlepis</i>, across the Gulf of Mexico
1:30–1:45 pm	Holly, D. Christopher, and Gary N. Ervin. Alteration of ecosystem function by a model invasive species: connecting pattern to process	Beamer, David A., and Trip Lamb. A new method for calculating isolation by distance and inferring gene flow: an example using woodland salamanders	Balfour, Martha E., and Llewellyn M. Ehrhart. Differences in physical characteristics of green turtle (<i>Chelonia mydas</i>) nests in natural and engineered dunes in the Archie Carr National Wildlife Refuge

	Room: HCB 205	Room: HCB 208	Room: HCB 207
	Ecology	Systematics, Molecular Biology, Functional Morphology, and Evolution	Microbial Ecology, Animal Behavior, and Conservation
1:45–2:00 pm	Martin, Charles W., John F. Valentine, Katherine Blankenhorn, and Susan A. Sklenar. The invasion of Eurasian milfoil (<i>Myriophyllum spicatum</i>) in Mobile Bay: does a reduction in disturbance frequency facilitate invasion success?	Eckstut, Mallory E., Brian I. Crother, and Daniel R. Brooks. Terrestrial biota of the Greater Antilles and Hawaiian Islands: comparative historical biogeographic patterns and species-area relationships as determined using PACT	Leibman, A. N., M. A. Roberts, M. D. Arendt, C. J. Anderson, B. Stender, A. Segars, D. Whittaker, and J. M. Quattro. Temporal variation in nesting beach contribution to a South Carolina subadult loggerhead sea turtle (<i>Caretta caretta</i>) feeding assemblage
2:00–2:15 pm	Pathikonda, Sharmila, Azmy S Ackleh, and Susan Mopper. Invasion, disturbance, and competition: modeling the fate of coastal plant populations	Schrader, Matthew, and Joseph Travis. Testing the viviparity conflict hypothesis: parent-offspring conflict and the evolution of reproductive isolation in a poeciliid fish	Sterrett, Sean C., Lora L. Smith, Stephen W. Golladay, Sara H. Schweitzer, and John C. Maerz. Evaluating riparian disturbance and their influence on aquatic turtles in the Lower Flint River Basin, Georgia
2:15–2:30 pm	Sargent, Lindsey, Stephen Golladay, Alan Covich, Stephen Opsahl, and Amy Rosemond. Invasion success of a nonnative crayfish Luhring,	Erismann, Brad E., and Philip A. Hastings. Breakdown of the size advantage: evolutionary changes in mating behavior influence the loss of sex change in groupers	Biggs, Brendan. Sponge-mediated coral reef restoration: sustainability of sponge use
2:30–2:45 pm	Savage, Amy M., Kenneth Whitney, and Jennifer Rudgers. <i>Anoplolepis gracilipes</i> invasion of the Samoan Archipelago: can mutualisms with native species amplify ecological impacts	Pinzone, Cheryl A., and Kenneth M. Fedorka. Sex with strangers: effect of male ejaculate on female immune response in <i>Drosophila melanogaster</i>	Scyphers, Steven B., Sean P. Powers, Kenneth L. Heck, Jr., and Carly S. Steeves. Shoreline stabilization and fisheries benefits of oyster reef restoration in coastal Alabama
2:45–3:00 pm	Wiens, Karen, and Susan Mopper. The ecological implications of temperature and salinity for a native and nonnative iris in coastal Louisiana	terHorst, Casey P., and Thomas E. Miller. Prey rapidly adapt to predation in pitcher-plant inquiline communities	Weese, David A., and Scott R. Santos. Genetic identification of source populations for an invertebrate in the aquarium trade
3:00–3:30 pm	Break		
3:30–3:45 pm	Atkinson, Carla L., Stephen Opsahl, Alan P. Covich, and Steve Golladay. Resource utilization and ecosystem services provided by <i>Corbicula fluminea</i> compared to a native mussel	Parnell, N. F., C. D. Hulsey, and J. T. Streelman. Hybridization produces novelty when mapping of form to function is many-to-one	Hess, Charles, and Antoine Laniray. Landscape changes on the Apalachicola National Forest

	Room: HCB 205	Room: HCB 208	Room: HCB 207
	Ecology	Systematics, Molecular Biology, Functional Morphology, and Evolution	Microbial Ecology, Animal Behavior, and Conservation
3:45–4:00 pm	Kaminski, Cynthia. Effects of forest canopy gaps on microarthropod populations in the southern Appalachians	Robbins, T. R., J. N. Pruitt, L. E. Straub, E. D. McCoy, and H. R. Mushinsky. Transgressive behavioral traits of <i>Sceloporus</i> hybrids confer fitness through advantage in territorial defense	DeLuca, John J., and Kathryn E. Sieving. The effects of farm-managment on the reproductive success of an openland, pest-eating songbird
4:00–4:15 pm	Sandidge, Rebecca, and Marcus Griswold. Logging riparian zones: impacts on epigaeic invertebrate communities	Fogarty, Nicole D. The significance of hybridization in a threatened Caribbean coral genus, <i>Acropora</i>	Fox, A., A. Schrey, H. Mushinsky, and E. McCoy. Genetic diversity and gene flow in the sand skink, <i>Plestiodon reynoldsi</i>, among continuous and interrupted scrub habitat in central Florida
4:15–4:30 pm	Wilkie, Jacquelyn. Spacial and temporal characterization of the surf zone macrofauna at Folly Beach, South Carolina	Sylvester, Jonathan B., Gareth J. Fraser, and J. Todd Streelman. Cichlid brain diversity develops at the boundaries	Sheehan, Kate, Just Cebrian, and Jack O'Brien. Distribution of parasite assemblages of grass shrimp in Mobile Bay
4:30–4:45pm	Myers, Darryl. Daniel Simberloff's ecological field experiments, 1969–1981	Toups, Melissa A., Aida T. Miro, and David L. Reed. Do modern humans have lice from archaic hominids?	
4:45–5:00pm	Daniel, Tara, and Cappellato. Carbon storage and sequestration in an urban greenspace	Havird, Justin C., and David H. Evans. The evolution of cyclooxygenase in the chordates	
5:30–7:30pm	Happy hour, poster session, and raffle (Dodd Hall)		
8:00–2:00am	Dinner and Painted Lady social event		

Oral Presentation Abstracts

Adreani, Mia, Florida State University. **Context-dependent streak spawning in the hermaphroditic seabass *Serranus subligarius*** (animal behavior).

In the simultaneously hermaphroditic marine fish *Serranus subligarius*, male role individuals are known to pair spawn, group spawn and streak spawn. These mating strategies are common among marine reef fish and their spawning behavior has been well studied. What is unclear is how each behavior translates into reproductive success and how these competing strategies may affect fertilization success. The variation in success of each strategy may pinpoint trade-offs with other aspects of their reproductive ecology such as territory acquisition and spawning frequency. In addition to studying their mating behaviors, environmental contexts under which streaking occurs have been explored. Although density is known to increase the incidence of streaking in this species, the ways factors such as habitat type and small-scale demographic dynamics affect the mating system are not well understood. Mating behaviors were recorded during the summers of 2005–2007 at three sites with different local population densities within St. Andrew's State Park, Panama City, Florida. Focal individuals were each observed in 15-minute increments, and the following were recorded: total number of spawns, number of streak spawns, habitat type, relative size of individuals. The occurrence of small sized individuals in the local population predicts a higher frequency of streaking behavior and these small fish are utilizing algal growth to remain hidden until a spawning event occurs. In addition, a field experiment indicated lower fertilization rates (85–90%) in spawning events that included one or more streaker. Further tests to distinguish the mechanism by which this occurs will be part of future studies.

Akob, Denise M., Lee Kerkhof, Anthony Palumbo, Kirsten Kuesel, and Joel E. Kostka, Florida State University. **Determination of the metabolically active microbial groups in subsurface sediments with a high potential for U(VI) bioremediation** (other).

Ethanol has been shown in laboratory and field based bioremediation studies to promote the microbiological reduction and immobilization of U(VI) in contaminated subsurface sediments. However, little is known about the composition and dynamics of this microbial community and how community dynamics will effect bioremediation potential. Therefore, the goal of this study was to directly link the phylogenetic structure with the

metabolic function of subsurface microbial communities that utilize ethanol as a carbon substrate/electron donor. To characterize the metabolically active microbial community, we employed stable isotope probing (SIP) techniques by amending sediment microcosms with ^{13}C -labeled ethanol. Microbial activity was monitored by measuring electron acceptor (NO_3^- , Fe(III) and U(VI)) and donor utilization. At selected time points, ^{13}C incorporation into community DNA was examined by density gradient centrifugation along with PCR amplification and terminal restriction fragment length polymorphism analysis (TRFLP). With the depletion of NO_3^- , metal reduction commenced with U(VI)-reduction preceding Fe(III)-reduction. The predominant and active nitrate reducers were identified as members of the Betaproteobacteria (*Dechloromonas* and *Diaphorobacter*). Members of the phyla Actinobacteria, Firmicutes and Bacteroidetes were also shown to be active during various phases of the incubations. Statistical analysis of TRFLP profiles revealed differences between the microbial communities present during nitrate and metal reduction. Members of the Betaproteobacteria and Actinobacteria may play an important role in nitrate removal and subsequent metal reduction, although further work is needed to elucidate the biogeochemical processes mediated by the microbial groups that incorporated ^{13}C -labeled ethanol.

Atkinson, Carla L., Stephen Opsahl, Alan P. Covich, and Steve Golladay, University of Georgia and the J. W. Jones Ecological Research Center. **Resource utilization and ecosystem services provided by *Corbicula fluminea* compared to a native mussel** (ecology).

Freshwater mussels are essential ecosystem engineers linking pelagic and benthic zones in aquatic systems. As filter feeders, the native mussels help purify the water and are sensitive indicators of stream health. *Corbicula fluminea*, an introduced bivalve, has been associated with native mussel declines, possibly due to competition with native mussels for food resources. However, little is known about differences in the feeding ecology of these species. Our research was designed to understand what native freshwater mussels and an invasive bivalve, *Corbicula fluminea*, feed on and how they cycle nutrients within the stream benthic environment. To determine dietary composition and potential overlap of *Corbicula* and the native mussel *Elliptio crassidens*, we measured the elemental and

isotopic compositions of their tissue, as well as benthic organic matter, sediment, and several size classes of seston at different streamflows. Our results indicate that differences exist in the food resources utilized by the two bivalve species. *Corbicula* may be better able to acquire and assimilate bacterial sources. Also, the presence of *Corbicula* may alter nutrient cycling in the benthic environment of coastal plain streams by retaining less nitrogen than native mussels, which may modify nutrient cycling in streams. These results have implications on how invasive species, such as *Corbicula*, may alter stream ecosystems.

Bagley, Justin C., and Phillip M. Harris, University of Alabama. **Taxonomy, population genetics, and body shape variation of Alabama spotted bass *Micropterus punctulatus henshalli*** (systematics).

Alabama spotted bass (*Micropterus punctulatus henshalli*) are endemic game fish restricted to the Mobile River basin above the fall line in Alabama and northwest Georgia, where they are sympatric with redeye bass (*M. coosae*). Based on quantitative descriptions of external morphology alone, Hubbs and Bailey (1940) recognized *M. p. henshalli* as distinct from northern spotted bass (*M. p. punctulatus*). Also, Bailey (1938) suggested spotted bass subspecies intergrade in the lower Pearl, Pontchartrain, Pascagoula, and Escambia drainages. We tested (i) the uniqueness of *M. p. henshalli* relative to *M. p. punctulatus* and *M. coosae*, (ii) the validity of the zone of intergradation, and (iii) for population structure in spotted bass using tests of phylogenetic relationship, genetic structure and differentiation, and body shape variation. Analyses of four microsatellite DNA loci, mitochondrial cytochrome b sequences, and body shape reveal contrasting patterns of hybridization and distinctiveness between study taxa. Population genetic analyses revealed high genetic admixture within and between groups. Alabama spotted bass are genetically more similar to redeye bass though morphologically similar to northern spotted bass, which are recovered as paraphyletic with one clade sister to smallmouth bass (*M. dolomieu*). Compared with fish from the Mobile River basin, spotted bass from intergrade drainages show fixed nucleotide polymorphisms supporting subspecific intergradation along the Gulf coastal plain. Until the mid-1990s, it was believed that hybridization between black basses was rare in nature; however, our results are consistent with other recent molecular evidence suggesting spotted bass hybridize with redeye bass.

Balfour, Martha E., and Llewellyn M. Ehrhart, University of Central Florida. **Differences in physical characteristics of green turtle (*Chelonia mydas*) nests in natural and engineered dunes in the Archie Carr National Wildlife Refuge** (conservation).

The Archie Carr National Wildlife Refuge (ACNWR), experienced severe erosion during the 2004 hurricanes. In 2005, sand from inland quarries was used to restore the dunes to protect coastal properties along 74% of the refuge beach. The remaining 26% remained unaltered. The sand provided increased reproductive habitat for the three species of marine turtles nesting on the refuge. The physical characteristics of the newly placed sand potentially differ from those of the natural sand. These differences in sand characteristics may alter the incubation environment, potentially affecting the calcium carbonate content, pH, porosity, and moisture found within the nests. These abiotic factors are crucial for the successful incubation of marine turtle eggs. We studied these engineered dune areas one year post construction to determine if any differences in the physical characteristics existed. Results were analyzed using a one-way ANOVA to determine any disparity between abiotic characters of the two treatments and how this might affect reproductive success (the percentage of eggs that produce hatchlings which emerge from the nest). The importance of the ACNWR as a rookery has increased as the number of green turtle nests has risen sharply over the past two decades. It is the stated policy of the National Wildlife Refuge System that, "wildlife comes first." As beach management intensifies, the maintenance of habitat conducive to successful marine turtle reproduction should assume primacy over coastal development and related issues, if that objective is to be met.

Beamer, David A., and Trip Lamb, East Carolina University. **A new method for calculating isolation by distance and inferring gene flow: an example using woodland salamanders** (evolution).

Models designed to predict isolation by distance generally assume that individuals disperse randomly across a homogeneous habitat. Since most habitats are heterogeneous, patterns of isolation by distance can be obscured, especially for species with low vagility. We devised a process to calculate effective distances between populations that accommodates the heterogeneous nature of their habitats. First, habitat quality is assessed using ecological niche modeling, and the resulting model is inverted, such that the model's lowest numbers represent the highest quality habitats. This inverted niche model provides a friction layer through which

the least expensive path is calculated via a least-cost path algorithm. The resulting distance of the least-cost path represents the effective distance between populations. Moreover, one can infer from this least-cost path the most likely route for historical gene flow between currently isolated populations. Woodland salamanders of the *Plethodon jordani* complex are used to illustrate the efficacy of this method.

Belford, Stanton, Martin Methodist College.

Analysis of coral distribution and coral symbionts in two reef "systems" in the southern Caribbean (ecology).

Baseline coral distribution and coverage data were collected at Toco Bay and Salybia Bay, two intertidal reef "systems" on the northeastern coast of Trinidad, West Indies. In March and August 2006 the diversity and coverage of coral communities were assessed in three intertidal zones at Toco Bay. Zones were divided into upper intertidal (0–10 m), intermediate (11–20 m), and lower intertidal (21–30 m) from the shoreline. At Salybia Bay, a fourth zone (31–40 m from the shoreline) was surveyed. The line and point intercept transect method was used to determine the cnidarian coverage along randomly selected transects at both bays. Coral (in the broad sense of the word) coverage along four random transects at Toco Bay was 53.3%; with *Zoanthus* and *Palythoa* spp. comprising 40% of said coverage and *Millepora alcicornis*, *Siderastrea radians*, and *Porites porites* comprising the remainder 13.3%. Live coverage at Salybia Bay was 9.4%. Quadrat data collected at both sites showed coral coverage at Toco Bay and Salybia Bay to be 47.9% and 10.3% respectively. Other major components of reef coverage were rock (24.2%) and algae (12.5%) at Toco Bay and algae (29.4%) and coral rubble (32.5%) at Salybia Bay. Coral diversity at Toco Bay was higher than at Salybia Bay throughout the inner reef flat. Zone 3 had the highest diversity of coral species than all other zones at both sites. Both line and point transect and quadrat methods provided a quick and simple way to estimate coral and benthic coverage at both reefs. Analysis of coral symbionts at both sites revealed two generalist symbionts in *Porites*, *Palythoa*, and *Zoanthus* spp. *Porites porites* at Toco Bay had *Symbiodinium* subspecies A4:3, while *Porites porites* at Salybia Bay had subspecies A4:1. Subspecies A4:1 was found in *Zoanthus sociatus* at both sites. It is not known if differences in symbionts between sites reflected differences in salinity, shading, water temperatures or anthropogenic effects between sites.

Biggs, Brendan, Florida State University. **Sponge-mediated coral reef restoration: sustainability of sponge use** (conservation).

Physical disturbances damage coral reef three-dimensional structure, leaving behind unstable debris. Reef recovery is dependent, in large part, on coral reestablishment, and substratum stability is critical to the success and survival of live fragments and coral recruits. Coral reef sponges, whose attachment can anchor live coral and stabilize loose carbonate, help mediate the process of reef rejuvenation by providing time for the consolidation of coral skeletons by crustose coralline algae. Restoration efforts currently employ epoxy and cement to secure rubble and upended colonies, but these agents are unnatural, possibly less attractive, and potentially unfavorable to coral larvae. Utilizing organisms that naturally bind and stabilize rubble to help restore reefs has largely been overlooked. On shallow, fringing reefs in Curacao, the feasibility of using sponges to aid rejuvenation of coral reefs was explored. Regrowth of branch tips removed from the sponges *Niphates erecta*, *Aplysina cauliformis*, and *Aplysina* sp. for seeding coral rubble was measured over 15 months to evaluate the sustainability of sponge use. Species differed significantly in volume of tissue regrown and percent of excised tissue regrown over time. Regrowth rates within species were highly variable, and neither sponge depth nor sponge size (total volume) explained differences well. Rates of attrition differed between species and over time within species and losses are attributed to injury by fishing gear and possibly disease. Rapid regrowth and reattachment rates exhibited by *Aplysina cauliformis* and *Aplysina* sp. suggest using these sponges to boost reef recovery is both feasible and sustainable.

Chabarria, Ryan E., Brian I. Crother, Mary E. White, and Henry Bart, Southeastern Louisiana University.

The phylogeography of *Necturus beyeri* in the southeastern United States (systematics).

The Gulf Coast waterdog (*Necturus beyeri*) is a paedomorphic salamander inhabiting streams and rivers along the gulf coast region of the southeastern United States from eastern Texas to western Georgia. The complex history of the gulf coast drainages of southeastern North America has led to incongruent patterns among taxa in previous comparative phylogeographic analyses. Because these salamanders are aquatic, the history of the drainages they inhabit likely affects the current genetic diversity of this species. In this study we utilized the mitochondrial encoded ND2 gene to infer the historical relationships of gene lineages within *N. beyeri*. Samples were collected from throughout the

range of *N. beyeri*. Because of debated species classification within the genus *Necturus* and the recent distributional changes of *N. beyeri* all currently recognized species of *Necturus* were included in the analysis. This will allow for the understanding of the historical processes that have shaped the current distribution of *N. beyeri*. Preliminary data suggest that the gene lineages of *N. beyeri* are paraphyletic. The implications of these findings as well as the utility of mtDNA in this analysis will be discussed.

Coffey, Peter, University of North Carolina, Asheville. **The effects of gape distance on the crushing force of crayfish chelae (*Cambarus bartonii*)** (functional morphology)

Crayfish are the largest freshwater invertebrates, and are essential in freshwater food webs as both primary and secondary consumers. Their specialized claws (chelae) play vital roles in the collection of food, defense against predators, and as weapons in inter- and intra-specific competition for territories and mates. Because chelae have so many functions, studying their mechanics is important to understanding how individuals interact directly with their environment. Using a force meter, the crushing force of chelae of a native crayfish, *Cambarus bartonii*, was determined as a function of the distance between the two fingers of the chelae (gape distance). These measurements determined the gape at which crayfish produced maximum force and measured size-dependent affects on the force generated. To compensate for fatigue, the order that gape distance was varied was randomized for each individual. On average, crayfish exerted maximum force when the gape distance was 35% of maximum chelae gape. The gape distance at which maximum force was measured was significantly correlated to every size measurement, but most strongly to pollex thickness. The mechanism that produces this relationship is unknown. However, because opponents' chelae are often targeted during aggressive interactions, these results indicate that crayfish grip is most powerful while grappling with a conspecific of similar size. Thus, the strongest selective force acting upon the relationship between maximum force and chela morphology may be intraspecific competition. Maximum measured force and average force were also significantly correlated to most size measurements, most notably apodeme surface area, indicating a strong relationship between size and strength of individuals of this species.

Cushman, E., N. Jue, A. Strand, and E. Sotka., College of Charleston. **Is there a genetic basis for the current separation between Gulf of Mexico and Atlantic stocks of the gag grouper (*Mycteroperca microlepis*)?** (molecular). The gag (*Mycteroperca microlepis*) is a large protogynous grouper important to fisheries in the United States. The gag fishery is currently managed as two separate stocks: the Gulf of Mexico and the Atlantic. A previous study found significant spatial genetic structure between sites in the Atlantic and the Gulf, but questioned whether this structure was really due to spatial differences between sites or to temporal genetic differentiation between yearly cohorts. We sampled adult and juvenile gag from North Carolina, South Carolina and Florida, 2005 young-of-the-year juveniles from North Carolina estuaries, and 1985 postlarvae from South Carolina estuaries, and genotyped one mitochondrial locus and eleven nuclear microsatellite. There was no spatial genetic differentiation between sampling locations in the Atlantic or in the eastern Gulf of Mexico and very little evidence of temporal differentiation between cohorts of varying ages. These results suggest that gag represent a single genetically panmictic population from North Carolina to the Florida panhandle. However, genetic homogeneity is also consistent with extremely low migration across populations that have not reached equilibrium between gene flow and drift. Thus, our genetic data can neither support nor refute current management schemes that independently regulate gag in the Gulf and Atlantic.

Dagg, Kendra, University of North Carolina, Asheville. **Acoustic defense against eavesdropping in duetting katydids, genus *Amblycorypha* (Orthoptera: Phaneropterinae)** (animal behavior).

In the katydid genus *Amblycorypha*, males and females perform duets to form pair bonds prior to mating. Males initiate the duet by producing a species-specific, long range calling song. A receptive female responds to a calling male with brief ticks placed within a species-specific time window in the male's song. Nearby males may eavesdrop on duets and search for the answering female. A previous experiment using *Amblycorypha alexanderi* showed that males eavesdrop and move in the direction of the responding female. In an unnamed species of *Amblycorypha* (referred to here as craggy) the male's calling song includes a series of ticks placed at approximately the same time window as the female's reply. It is hypothesized that the male produces these ticks as a defense against eavesdropping males, and that the ticks may prevent eavesdroppers from hearing the female's reply. To test this acoustical

defense hypothesis, craggy males were placed in an indoor arena with two speakers broadcasting separate parts of pre-recorded craggy duets. Placements of the two speakers were randomized to control for any directional bias within the arena. Craggy males moved significantly more in the direction of the male broadcast compared to the female broadcast, thus thwarting any potential mate stealing by eavesdropping males. In *A. alexanderi* the male's calling song lacks an imitation female reply, and in that species, males moved significantly more toward the broadcasted female reply. This suggests that ticks within the craggy male's calling song can confuse eavesdropping males and function as acoustic mate guarding.

Daniel, Tara, and Cappellato, Rhodes College.
Carbon storage and sequestration in an urban greenspace (ecology).

Urban greenspace provides an often overlooked but potentially significant sink for carbon. This study derived a STELLA model to calculate the annual carbon storage and sequestration of an old-growth forest located in midtown Memphis, Tennessee, compiling data from field studies of the nearly 70 hectare park. This model simulates the various processes contributing to carbon storage, sequestration, and flux in a terrestrial ecosystem, calculating the carbon storage within tree biomass based upon Leaf-Area Indexes and employing soil respiration measures both specific to this greenspace. Inputs were designed to vary over an annual timescale coinciding with growth cycles, thus constructing a functionally realistic model of carbon flux in a small, open system. The value of this model lies in its applicability for demonstrating the multifaceted dynamics of carbon flux on a scale able to be visualized, its adaptability to other greenspaces or old-growth forests of the southeast, and its estimation of one ecosystem service provided by an urban greenspace.

Davenport, Jon M., and David R. Chalcraft, East Carolina University. **Influences of alternative prey on interactions among intraguild predators** (ecology).

It is surprising that top and intermediate predators coexist since they compete for food resources and top predators eat intermediate predators. Coexistence could be promoted if abundance of alternative prey (shared or unshared) is sufficient to reduce interspecific competition between predators and/or by providing different prey for top predators to consume. We conducted an experiment to evaluate how abundance of larval *Pseudacris crucifer* (top and intermediate predator prey),

microinvertebrates (intermediate predator prey) and larval overwintered *Rana* (top predator prey) affected fitness components of larval *Ambystoma opacum* (intermediate predator) in the presence of larval *Anax* spp. (top predator). We hypothesized that abundance of alternative prey (either shared or unshared) would alter the effect of *Anax* on *A. opacum* fitness. We found that *Anax* reduced *A. opacum* survivorship but this effect was not dependent on the abundance of resources (shared or unshared). By reducing the number of *A. opacum* present in a pond, *Anax* caused surviving *A. opacum* to grow larger. Abundance of unshared prey did not alter *A. opacum* growth or the effect of *Anax* on *A. opacum* growth. *Anax* had a greater positive effect on *A. opacum* growth when there was a relatively high abundance of both shared and unshared prey than when shared prey was absent. Our results suggest that alternative prey will not promote the survival of larval *A. opacum* when *Anax* is present. Since larger *A. opacum* have greater reproductive potential, *A. opacum* is more likely to persist in environments with *Anax* when resource availability is high.

DeLuca, John J., and Kathryn E. Sieving, University of Florida. **The effects of farm-management on the reproductive success of an openland, pest-eating songbird** (conservation).

There are a variety of reasons to increase birdlife on farms: most farmers appreciate birds, government and consumers are pushing for biodiversity augmentation on farms, farmlands are increasingly replacing natural habitat, and many birds act as biological pest-control agents. However, agroecologists cannot responsibly encourage organic farmers to invest time, energy, and money to attract pest-eating songbirds to their lands without first answering two questions with more certainty: How good are pest-eating birds for organic farms, and how good are organic farms for pest-eating birds? We argue that the Eastern Bluebird (*Sialia sialis*) serves as the most promising pest-control agent of the three most-common farmland insectivorous birds in our study-region (north-central Florida; Jones et al. 2005), for it is unique in that it specializes on insects throughout the entire year. In 2007, we tested the hypothesis that farm-management (organic, conventional, and natural control) affects the reproductive success of Eastern Bluebirds. In 2008, we are testing the mechanistic hypothesis that food availability limits the first-egg-date of Eastern Bluebirds. We are also currently answering a question of importance to both farmers and agroecologists: What proportion of on-farm insect-pests are eaten by Eastern Bluebirds on organic farms? DeLuca will present results and conclusions

from the 2007 field-season, as well as current directions.

Doffitt, Chris, Lisa Wallace, and Gary N. Ervin, Mississippi State University. **Phylogenetic relationships of the genus *Amsonia* (Apocynaceae) in North America based on trnH-psbA and trnD-trnT sequence data** (systematics).

Amsonia is one of the few genera in the Apocynaceae with a primarily holarctic distribution. The approximately 20 species are found in four geographic regions: southeastern and southwestern North America, the Mediterranean, and Japan. This distribution represents a disjunct pattern that is also observed in many other taxonomic groups. The groups of species found in southeastern and southwestern North America appear to be complexes of closely related species, several of which are rare or of conservation concern. This work examines the relationships of the species within southeastern and southwestern North America and their relationships to the species from the Mediterranean and Japan utilizing cpDNA sequences derived from the trnH-psbA and trnD-trnT. Initial results indicate some southeastern taxa are conspecific with the wide-ranging species *Amsonia tabernaemontana*. Preliminary results also provide evidence that two morphologically similar species, *Amsonia ciliata* and *Amsonia hubrichtii*, are not closely related, and that *Amsonia tabernaemontana* is not monophyletic.

Eckstut, Mallory E., Brian I. Crother, and Daniel R. Brooks, Southeastern Louisiana University.

Terrestrial biota of the Greater Antilles and Hawaiian Islands: comparative historical biogeographic patterns and species-area relationships as determined using PACT (evolution).

The histories of the Greater Antilles and the Hawaiian Islands are exceptionally different. The Greater Antilles history is continental, ancient (late Cretaceous), and involve complex island fragmentations and fusions. In comparison, the Hawaiian Islands are oceanic, relatively young, and have a simple discrete order of appearance without subsequent reticulations. As such, the associated speciation events are hypothesized to vary in complexity between the two island groups. We analyzed the influence of phylogeny on species-area relationship utilizing PACT (Parsimony Analysis for Comparing Trees), an analysis method that synthesizes multiple taxon-area cladograms. We found strong linear species-area relationships in the Greater Antilles, while the younger and less complex Hawaiian Islands had very weak species-area relationships. In the Greater Antilles, in situ and

biotic expansion occurred in roughly equal proportions, and the majority of the biotic expansion events occur through forward dispersal.

Alternatively, the Hawaiian Islands have substantially more biotic expansion events than in situ events, while both forward and back dispersal occurred in roughly equal proportions. We suggest that these differences are largely due to the differing age and geologic histories of these island systems.

Erisman, Brad E., and Philip A. Hastings, Scripps Institution of Oceanography. **Breakdown of the size advantage: evolutionary changes in mating behavior influence the loss of sex change in groupers** (evolution).

The size-advantage model asserts that mating system characteristics influence the incidence and direction of sex change in animals. Although it is supported by numerous experimental and theoretical studies, none have tested predictions of the model within the context of a robust, species-level phylogeny. Using this approach, we tested whether changes in sexual pattern in groupers (Teleostei: Epinephelidae: Epinephelini), and in particular the loss of sex change, were related to changes in two traits related to the mating system: mating group structure and sperm competition intensity. All phylogenetic reconstructions indicated that protogyny and pair spawning are the plesiomorphic conditions for the lineage; both gonochorism and group spawning evolved independently at least four times in three different genera. Tests of correlated evolution showed that evolutionary transformations in sexual pattern from protogyny to gonochorism were significantly correlated with transformations in mating pattern from paired to group spawning, and transformations in mating group structure occurred prior to or simultaneously with transformations in sexual pattern. Sperm competition, as reflected by relative testes weights in males, is significantly higher in gonochoric species than protogynous species. This phylogenetic comparative study suggests that the loss of sex change in some groupers was influenced by changes in mating group structure from paired to group spawning and associated increases in sperm competition among males. Moreover, it provides phylogenetic support for predictions of the size-advantage model and empirical evidence for the influence of sperm competition on sex allocation in animals.

Fenwick, Allyson, University of Central Florida. **Meta-analysis and phylogenetics: the Great American Biotic Interchange as a case study** (systematics).

Meta-analysis is a tool commonly used to answer ecological questions, but it is rarely used in evolutionary research. The statistical process involves determining effect sizes for multiple studies and then calculating an overall effect size as a test of the significance of the factor of interest. Because historical biogeographic hypotheses are best tested with multiple independent lineages, meta-analysis of phylogenies with associated divergence dates can be a powerful tool for testing the effect of a particular event on speciation rates of a variety of taxa. The closure of the Isthmus of Panama 3.5–2 million years ago and the associated Great American Biotic Interchange has been proposed as a major driver of diversification, although other researchers have argued that major radiations had occurred before isthmus closure. Using meta-analysis, I tested the effects of the closure of the Isthmus on speciation rates of terrestrial and freshwater angiosperms and vertebrates. I also tested the influence of dispersal mode on speciation rates. Our results suggest that this event did not have a significant effect on speciation rates overall, and highlights one way in which molecular evidence is reevaluating conclusions drawn from fossils.

Fierst, Janna L., and Thomas F. Hansen, Florida State University. **Genetic architecture in reproductive isolation** (evolution).

The Bateson-Dobzhansky-Muller model of speciation predicts that post-zygotic isolation evolves due to the accumulation of incompatible epistatic interactions, but few studies have quantified the relationship between genetic architecture and reproductive divergence. Directional epistasis has been shown to be important in the evolution of genetic architecture, and we examined how the direction and magnitude of epistatic interactions influenced the evolution of hybrid incompatibilities in an individual-based simulation model. We found that populations evolving under stabilizing selection experienced suites of compensatory allelic changes that resulted in genetic divergence between populations despite the maintenance of a stable, high fitness phenotype. A small number of loci were then incompatible with multiple alleles in the genetic background of the hybrid and these interactions resulted in loss of fitness for both F1 and F2 hybrids. The identity of these incompatibility loci changed throughout the evolution of the populations. Reproductive isolation did not evolve when epistatic interactions were very strong or very weak, and

directional epistasis resulted in a more rapid loss of hybrid fitness than nondirectional epistasis. These results have implications for empirical studies, and suggest that in a polygenic context, reproductive divergence may occur through a few loci that cause incompatibilities throughout the hybrid genome.

Fogarty, Nicole D., Florida State University. **The significance of hybridization in a threatened Caribbean coral genus, *Acropora*** (evolution).

Caribbean acroporid corals, *Acropora palmata* and *A. cervicornis*, have experienced dramatic declines since the 1970s and are listed as threatened under the Endangered Species Act. These species form a hybrid, *A. prolifera*, which was not given protective status but its ecological and evolutionary roles may influence the fate of this reef-building genus. Throughout the Caribbean hybrids vary in abundance with no clear geographic pattern. This study will determine if this variation occurs as a result of differences in the strength of reproductive isolating barriers, variation in success of asexual fragmentation, or differential fitness of hybrids. Observations of overlapping spawning times and no statistical difference in conspecific and heterospecific no-choice crosses suggested a lack of isolating barriers; however, choice crosses revealed conspecific sperm precedence (CSP). CSP is only effective when conspecific and heterospecific sperm collide with an egg simultaneously; therefore, the decline in the parental species may lead to increased hybridization. Hybrid ramet abundance varied across sites; however, this was a poor indicator of hybrid genetic diversity. Hybrids were often found in extremely shallow habitats where disturbances generated fragments and encouraged asexual propagation. Hybrids persisted in this habitat by fast reattachment rates and their ability to withstand thermal and irradiant stress, possibly as a result of a unique clade of zooxanthellae found in some hybrids. The prevalence of the typical afflictions that plague acroporids (e.g., bleaching, disease, parasitism, and predation) was comparable in the parental species and hybrid. These results suggest habitat selection and disturbance frequency dictates hybrid abundance.

Fox, A., A. Schrey, H. Mushinsky, and E. McCoy, University of South Florida. **Genetic diversity and gene flow in the sand skink, *Plestiodon reynoldsi*, among continuous and interrupted scrub habitat in central Florida** (conservation).

The sand skink, *Plestiodon reynoldsi*, is a fossorial lizard restricted to the scrub located on the central ridges of peninsular Florida. The sand skink is threatened throughout its range, and urban and agricultural development of its already naturally

fragmented habitat poses a conservation threat. As a result of natural fragmentation, barriers to gene flow may already exist, and further development may have consequences for the genetic diversity of *P. reynoldsi*. Previous research shows genetic structure throughout the range of *P. reynoldsi*. The goal of our study is to conduct a more fine scale examination on the extent of gene flow within and between scrub patches, using multiple microsatellite DNA loci. We screened 8 previously developed microsatellite loci in individuals from a seemingly continuous scrub habitat in Davenport, Florida (n = 96) and from the scrub surrounding the Archbold Biological Station (n = 148) near Lake Placid, Florida. The Archbold region has patches of unsuitable wetland habitat, which may serve as barriers to gene flow, as well as, regions of more homogeneous scrub habitat. Assignment testing results (Structure and Geneclass2) indicate Davenport and Archbold are genetically distinct populations (K = 2; >90% correct assignment). Estimates of genetic differentiation were significant ($F_{ST} = 0.024$, $P < 0.001$) among sites; results followed an isolation by distance pattern. Results also suggest further differentiation may exist within sites. We are developing additional microsatellite loci and screening additional individuals to investigate the levels of relatedness within patches and the amount of genetic differentiation among sampled scrub habitat.

Green, Stefan J., David F. Blake, and Jennifer G. Blank, Florida State University. **A novel microbial mat developing in ophiolite-hosted moderately alkaline springwater** (ecology).

On the modern Earth, microbial mats are usually restricted to environments where metazoal grazing is limited by "adverse" environmental conditions. Freshwater mats not associated with physical extremes are rare. Here, we report on a microbial mat developing in a small pond fed by moderately alkaline (pH 8.5 to 9.0) spring water derived from the Del Puerto Ophiolite (California). In addition to the pH, the water chemistry is unusual, with elevated magnesium and bicarbonate. We characterized the microbial community to gain insight into the persistence of this thin, stratified microbial mat, thriving despite the apparent absence of inhibitory environmental conditions. We performed cultivation-independent molecular analyses to identify the dominant microorganisms in this system. Analyses specific to the domain Bacteria revealed the presence of a diverse community of common soil and water bacteria, and two dominant, novel clades of cyanobacteria most closely related to cyanobacteria from geothermal microbial mats. The archaeal communities in the microbial mat and the

sediment below were comprised primarily of H_2 -consuming methanogens. We propose that the biogeochemical cycling in this system is dominated by primary production by cyanobacteria coupled to anaerobic degradation of organic matter via fermentation and methanogenesis. The moderately alkaline water derived from these ophiolites may serve as an analog to extraterrestrial planetary bodies where mafic and ultramafic rocks are common and liquid water is present.

Havird, Justin C., and Larry M. Page, University of Florida. **Systematics of the *Lepidocephalichthys* complex and evolution of sexual dimorphism in loaches** (systematics).

Loaches of the genus *Lepidocephalichthys* (Cobitidae) are widely distributed in Asia, ranging from India and Pakistan to China and Malaysia. These freshwater fishes are small loaches (ranging from 13 to 80 mm SL) in the family Cobitidae that inhabit most freshwater environments in southeast Asia and some species have become popular aquarium fishes. There are currently 15 recognized species in *Lepidocephalichthys* and 7 species in the closely related genera *Lepidocephalus* and *Kottelatlimia*. The systematics of these loaches is chaotic. The most recent reviews of the *Lepidocephalichthys* complex described new species, but did not remark on characteristics of the related genera or address species outside the ranges of the study areas. Motivated by recent collections in Sumatra and Thailand, we provide a review of the genera *Lepidocephalichthys*, *Lepidocephalus*, and *Kottelatlimia*. This includes the characteristics of these and other closely related genera, descriptions of all common species, a description of a new species from Thailand, and a discussion of relevant morphological characters used for classification. One such character is a modification of the pectoral rays in mature males, referred to as the lamina circularis. We also describe the high level of variation in this character within the Cobitidae, discuss other types of sexual dimorphism found in loaches, and address its use in systematics; particularly in reference to a proposed new genus from southeast Asia.

Havird, Justin C., and David H. Evans, University of Florida. **The evolution of cyclooxygenase in the chordates** (molecular).

Cyclooxygenase (COX) is the enzyme found in animals responsible for converting arachidonic acid into prostaglandins. These prostaglandins then perform multiple functions including regulation of inflammation responses, changes in vascular tone, and ion transport/osmoregulation. There are two main forms of COX found in vertebrates: COX-1 and COX-2. There are also two nonvertebrate COX forms found in the sea squirts (*Ciona*) named COXa and COXb which represent an evolutionary independent lineage of COX in the chordates. Therefore, the first goal of this study was to sequence COX forms from evolutionarily ancestral chordates in order to more fully understand the evolutionary history of COX in the chordates. Another goal was to confirm current studies which hypothesize that a genome duplication event and subsequent losses of COX genes have resulted in multiple COX-1 and

COX-2 forms in the teleosts. Using standard primer design, PCR, and cloning methods, 9 novel COX sequences were obtained from the lancelet, Atlantic hagfish, sea lamprey, euryhaline killifish, and longhorn sculpin. These sequences readily align with other COX forms and contain all the critical domains and amino acids for cyclooxygenase function. To further characterize the evolution of COX in the chordates, phylogenetic analyses were performed using COX protein sequences from a wide range of chordates, including the novel sequences found in this study. The results of these analyses suggest a complex evolutionary history for COX, characterized by at least 3 distinct lineages in the chordates represented by the urochordates, cephalochordates, and vertebrates.

Hess, Charles, and Antoine Laniray, Florida State University. **Landscape changes on the Apalachicola National Forest** (conservation).

Historical practices and a focus on uplands have led many land managers to believe that 3- to 5-year fire return intervals are enough to maintain the longleaf pine ecosystem. On the Apalachicola National Forest (ANF), the current fire regime has allowed many fire-dependent species to persist, and this forest is considered one of the best-burned parcels in the National Forest system. The fire return frequencies in the ANF have failed to maintain the characteristic transition zones between the coniferous uplands and deciduous bottomlands. I analyzed aerial photographs taken over a span of 70 years for 50 randomly selected sites and used GIS to estimate the amount of encroachment of titi (*Cyrilla racemiflora* and *Cliftonia monophylla*) into the transition zones. In that period an estimated 14% (80,000 acres) of the wet prairie/longleaf system has been lost to titi encroachment. When areas with greater than 5-year fire return intervals were compared to those with 3- to 5-year intervals, no significant differences were observed. Only one compartment in the sample showed evidence of maintaining the wet flats characteristic of the Apalachicola and it had a fire-return interval of less than 3 years. These results suggest that fire-return intervals of more than three years, at least with non-growing-season burns, are not adequate to maintain the edges of the longleaf pine ecosystem.

Holly, D. Christopher, and Gary N. Ervin, Mississippi State University. **Alteration of ecosystem function by a model invasive species: connecting pattern to process** (ecology).

In situ decomposition of above and belowground plant biomass of the native grass species *Andropogon glomeratus* (Walt.) B.S.P. and

exotic *Imperata cylindrica* (L.) Beauv. (cogongrass) was investigated using litter bags over the course of a 12 month period. The above and belowground biomass of the invasive *Imperata* always decomposed faster than that of the native *Andropogon*. Also, belowground biomass of both species decomposed at a consistently faster rate when placed within an invaded area consisting of a monotypic stand of *Imperata* as opposed to within a native plant assemblage. However, there was no similar such trend observed in the aboveground plant material. The microbial communities associated with the invaded sites often differed from those found in the native vegetation and provide a possible causal mechanism by which to explain the observed differences in decomposition rates. The microbial communities differed not only compositionally, as indicated by ordination analyses, but also functionally with respect to enzymatic activity essential to the decomposition process. This study supports the growing consensus that invasive plant species alter normal ecological processes and highlights a possible mechanism (alteration of microbial assemblages) by which *Imperata* may alter an ecosystem process (decomposition).

Jue, Nathaniel, Thierry Brule, Chris Koenig, and Felicia Coleman, Florida State University. **Shelf to shelf? Gene connectivity of gag, *Mycteroperca microlepis*, across the Gulf of Mexico** (evolution).

Populations of the grouperfish gag across the Gulf of Mexico on the West Florida Shelf and Campeche Back are examined for patterns of gene connectivity. Current models, differential reproductive timing, and settlement patterns suggest the possibility of asymmetric gene flow. Mitochondrial control region and microsatellite markers are examined to explore patterns of connectivity. Data suggest some evidence for differentiation among populations and unevenness in genetic exchange.

Jones, Estelle, and Kimberly Bohn, University of Florida. **Control methods for the invasive Japanese climbing fern in natural areas of northwest Florida and implications to nontarget forest plants** (ecology).

Japanese climbing fern (*Lygodium japonicum*) is a nonnative invasive plant species in the southeastern United States that is listed on the Noxious Weed List by the Florida Department of Agriculture and Consumer Services. It disrupts the structure and function of Florida's natural ecosystems. Native forest species must compete with the vigorous fern for resources including space, light, moisture, and nutrients. It can form thick mats

smothering ground vegetation and has been seen climbing in tree tops, creating an impediment to certain forest management activities such as prescribed burning. The objectives of this study were to evaluate the effectiveness of chemical treatments as a control for the invasive fern and to evaluate the response of nontarget plants to the chemical treatments and absence of the fern. Four sites were chosen across north Florida to conduct the study. There were fifteen treatments of metsulfuron, glyphosate, and imazapyr at different rates and different combinations. Our preliminary results show that the high rate of glyphosate, the glyphosate-metsulfuron tank mix, and the three-way mix of glyphosate, metsulfuron, and imazapyr had the greatest effect on % crown reduction of fern, with 80% or more reduction 60 days after treatment compared to the control plot which had about 16% crown reduction due to frost dieback. Previous studies have suggested the use of metsulfuron because it caused less damage to native understory plants than glyphosate. Further research will evaluate residual effects of these treatments on nontarget plants and long-term control of Japanese climbing fern.

Kaminski, Cynthia, University of North Carolina at Asheville. **Effects of forest canopy gaps on microarthropod populations in the southern Appalachians** (ecology).

This study explored the effects of canopy disturbance on soil microarthropod abundance at five sites within Coweeta Hydrologic Laboratory, in the Nantahala Mountain Range of western North Carolina. Scientists at Coweeta have been studying the impact of forest disturbance from natural disasters such as hurricanes and ice storms. In March 2002 canopy gaps were formed by felling trees to mimic these disturbances. Eight experimental plots of gapped canopy and two control plots of closed canopy were used within each of the five sites. Two of the five sites measured 20 m, versus 40 m, in diameter to test the effects of gap size. Microarthropods were collected using 15 cm² mesh bags filled with 2 g of leaf litter. Litter bags were placed in a three by four pattern at each plot on February 1, 2004, and were collected every other month for two years. To examine canopy effects, average oribatid, collembola and total microarthropod numbers were compared between gapped and control plots. Gap size effects were also investigated by comparing differently sized control and gapped plots. A significant difference was found between control and gapped plots for all three categories of microarthropods. However, there was no significant difference due to size variation in

either control or gapped plots. Abiotic factors did not differ between gap and control plots. Similarity in abiotic factors was attributed to the aggrading forest growth in gap plots. Significant differences in microarthropod numbers were attributed to presumed greater litter inputs in control plots.

Kimble, S. J. A., and R. W. Thacker, University of Alabama at Birmingham. **Phylogenetic and taxonomic distinctness of populations of Caribbean mangrove root sponge species** (ecology).

The roots of tropical mangrove trees form an ecosystem (mangal) that provides habitat for a high diversity of marine organisms including algae, bacteria, cnidarians, gastropods, sea stars, bivalves, bryozoans, ascidians, juvenile fishes and sponges. How many marine communities are structured remains poorly understood, including mangrove sponge communities. Biodiversity indices abound in ecology, but most are overly sensitive to sample size and do not account for the higher taxa represented by the species present. Evaluations of higher taxonomic data can be valuable for detecting perturbation of communities before traditional biodiversity indices can. Biodiversity indices accounting for higher taxon data have recently been developed and are used to measure the biodiversity of sponge communities in the Caribbean. Using survey data from Belize and Panama, these new indices are used to measure the taxonomic distinctness of sponge communities at various levels of geographic resolution. Phylogenetic evaluations of these communities are also studied using mitochondrial cytochrome oxidase subunit 1 (CO1) sequences available from online databases and sequenced in our lab. Other applications are undertaken using these data, including a biogeographic evaluation of the effects of mangrove island size on sponge community makeup.

Kocot, Kevin M., and Scott R. Santos, Auburn University. **Secondary structural modeling of the second internal transcribed spacer (ITS2) from *Pfiesteria*-like dinoflagellates (Dinophyceae)** (molecular)

Pfiesteria piscicida is a harmful bloom-forming alga that has received a great deal of attention due to its association with large fish kills and neurological problems in humans. Since the discovery of *Pfiesteria*, several other *Pfiesteria*-like dinoflagellates (PLDs) have also been identified. Genetic identification and phylogenetic relationships among the PLDs commonly utilize sequence data from the genes and spacers of the ribosomal RNA (rDNA) operon. Of these, the internal transcribed spacers (ITSs) have been previously shown to fold

into secondary structures that are critical for proper ribosomal processing. In this study, we modeled the secondary structure of the second internal transcribed spacer (ITS2) from sixteen PLDs (as well as an outgroup taxon) using minimum free energy and phylogenetic comparative methods. The secondary structural models predicted for these dinoflagellates consisted of four paired helices separated by five unpaired regions, consistent with those reported from many eukaryotes. All of the structures were highly stable ($\Delta G = -66.1 - -122.3 \text{ kcal} \cdot \text{mol}^{-1}$ at 37°C) and several structural characters were found to be conserved either across the PLDs or were specific to monophyletic subgroups, strengthening previously inferred phylogenetic relationships among taxa. Additionally, an 18 bp motif was identified in the PLDs whose position corresponds to a ribosomal processing site described from other eukaryotes. Potential applications of these ITS2 secondary structures include utility in strain and species identification as well as serving as a tool for identifying and excluding rDNA pseudogenes when assessing biodiversity within the PLDs.

Kovacs, Jennifer L., and Michael A. D. Goodisman, Georgia Institute of Technology. **I will survive: what factors influence hibernation survival in social wasp queens?** (animal behavior).

In order to produce reproductive offspring, queens of annual yellow jacket species must survive for an entire year. The path to reproduction is treacherous, and only a small percentage of those queens produced by a colony actually make it the full year. It is thought that many die off during the long, cold months spent overwintering, but the factors that affect queen survival, and therefore their fitness, are unknown. Previous studies performed in our lab have found that queens with longer lengths and from particular colonies mate at higher frequencies than shorter queens from other colonies, but whether these queens are somehow more fit and therefore better able to survive hibernation is unknown. Previous studies performed in bumble bees found that mating status (i.e., mated vs. unmated), as well as the colony the male mate originated from, influenced queen overwintering survival in that species. In this study, we explored various factors, such as mating status, mass before hibernation, body length, colony of origin, etc., that may influence overwintering survival. To do this, we mixed unmated queens with queens that had mated with males under laboratory conditions, in hibernation boxes that were maintained at 4°C , and checked weekly for recently expired queens. Dead queens were removed and morphological measurements were taken. The results of this study will provide us with a better

understanding what traits a "fit" queen possesses and will shed light on other areas of interest, such as mate choice and polyandry in social insects.

Kowal, Virginia Anne, University of North Carolina at Asheville. **The effect of sampling effort on species richness estimates of flower visitors** (ecology).

Estimates of species richness, while useful and common to many subdisciplines of biology, are problematic in their reliance on adequate sampling effort. How much sampling is required for an accurate estimate of species richness, and what levels of sampling will render communities comparable? These are important questions that must be addressed before conclusions can be drawn regarding the relative richness of communities and environments. I observed flower visitors at four plant species in the presence and absence of an invasive plant to determine the sampling effort necessary to accurately estimate species richness of flower visitors. Visitor species were recorded exhaustively in a single flowering season. Visitors were also examined for the pollen of the visited plant to ascertain whether visitor richness accurately measured pollinator richness. Empirical visitor accumulation curves for each plant species suggest qualitatively that even when sampling effort was high, saturated species richness estimates were elusive for some of the plant species. Results indicate that some visitor species were not pollinators, and that the frequency of visitation of a particular visitor species did not predict whether this species was likely to carry pollen. Asymptotic species richness counts were used to show that visitor species numbers and diversity were not significantly affected by the presence of an attractive invasive plant. While documenting empirical and exhaustive visitor taxon sampling curves for four plant species, this work explores the sampling dynamics of plant-pollinator communities and highlights the effect that inadequate sampling effort may have on overall characterization of plant-insect community structure.

Leibman, A. N., M. A. Roberts, M. D. Arendt, C. J. Anderson, B. Stender, A. Segars, D. Whittaker, and J. M. Quattro, University of South Carolina. **Temporal variation in nesting beach contribution to a South Carolina subadult loggerhead sea turtle (*Caretta caretta*) feeding assemblage** (conservation).

The loggerhead sea turtle (*Caretta caretta*) possesses a unique life history that includes complicated subadult and adult migratory patterns. For example, subadult individuals are known to congregate annually in large coastal feeding assemblages, but the contribution to these

assemblages from proximal nesting beaches remains obscure. To better understand the contribution of discrete nesting beaches to feeding assemblages off the southeastern U.S. coast, an in-water survey was conducted from Wilmington, North Carolina, to St. Augustine, Florida, targeting subadult loggerhead sea turtles with both fisheries-dependent and fisheries-independent trawling over a seven-year period. In recent years, however, the focus of the survey has been more concentrated in those feeding areas in and around Charleston, South Carolina. In this study, genetic data (mtDNA control region sequences) were used to validate the Charleston feeding assemblage as an appropriate proxy for the entire South Carolina coast; subsequently these data were used to assess temporal variation in nesting beach contribution to the coastal subadult feeding aggregation. We compare this temporal component of genetic variation to that component among nesting beaches, and discuss the use of these data in conservation efforts aimed at this threatened species.

Lotterhos, K. E., Florida State University. **Using dynamic regression models to estimate the relative role of competition and environmental forcing in the recruit abundances of Pacific coast rockfish** (ecology).

A central question in population dynamics is understanding the relative roles of environmental variance versus species interactions in determining species abundances. The estimation of competition coefficients in many species is difficult without knowledge of the naturally occurring densities and the scale of interaction. This is particularly true for fish species, where manipulation of species densities is difficult. Using a dynamic-regression approach, I am investigating the relative role of environmental forcing and species interactions in determining the recruit abundances of two competing species of rockfish: the black rockfish, *Sebastes melanops*, and the yellowtail rockfish, *Sebastes flavidus*. Recruitment in this system is highly driven by the oceanographic process of upwelling, which drives production during the larval period of rockfish.. But the relative importance of upwelling versus species interactions in determining recruitment is not well understood. The results from this study will be important in the management and conservation of Pacific coast rockfish, which compromise the core of the Pacific coast bottom fishery.

Luhrling, Thomas M., University of Georgia, Savannah River Ecology Laboratory. **Population ecology of greater siren** (ecology).

We have, at best, a basic understanding of the life histories of the permanently aquatic "giant

salamanders" of the southeastern Coastal Plain (Amphiumidae and Sirenidae). The role that sirenids, in particular, play in wetland ecology is poorly understood. What we do know from previous studies is that greater siren, *Siren lacertina*, can attain substantial concentrations of biomass (233 g/m²), prey heavily on a myriad of invertebrates, and will consume other aquatic salamanders. I conducted a mark-recapture study at Dry Bay, a 5-ha Carolina bay in South Carolina, from September 2006 to September 2007. Monthly capture sessions consisted of 10 consecutive nights of sampling with a variety of traps. A robust design was used for the first and last four months of the study to permit population analysis with program mark. Preliminary estimates at Dry Bay indicate a much more conservative estimate of biomass and densities of greater siren than previous studies. I also present estimates for, survivorship, recapture probability, size classes, individual growth rates, minimum size at first reproduction, and seasonal changes in the average body condition index of individuals within the population.

Manjerovic, Mary Beth, and Jane M. Waterman, University of Central Florida. **Trade-offs of reproductive quality and immunity in a highly promiscuous species** (animal behavior).

A central component to understanding evolutionary biology is to examine the trade-offs that exist for maximizing reproductive success. The ability to reproduce successfully may be compromised by the body's physiological response to infection. The trade-off is further complicated when individuals multiply mate, as degree of infection potentially increases with increasing promiscuity. Males in highly promiscuous systems invest more in testicular tissue to offset sperm competition but levels of spermatogenesis vary with immune function. The immunocompetence handicap hypothesis (ICHH) suggests that male sexual traits may lower the ability to resist pathogens through steroid suppression of the immune system (Foldstad & Karter 1992). In order to examine the relationship between reproductive success and immunity, we looked at ejaculate characteristics (e.g., investment, quality) and indicators of immune function (e.g., spleen size, leukocytes) in a highly promiscuous species. Preliminary data show a significant negative relationship between testes size and spleen mass suggesting that males with increased pathogen resistance experience high immunosuppression which would be consistent with an increase in spermatogenic investment and ejaculate quality.

Martin, Charles W., John F. Valentine, Katherine Blankenhorn, and Susan A. Sklenar, University of South Alabama/Dauphin Island Sea Lab. **The invasion of Eurasian milfoil (*Myriophyllum spicatum*) in Mobile Bay: does a reduction in disturbance frequency facilitate invasion success?** (ecology).

Biological invasions are among the most pervasive yet least understood consequences of the urbanization of our estuarine ecosystems. In Mobile Bay, this urbanization has led to the construction of an earthen causeway, HWY 90, which has been hypothesized to have created a "vacant niche" that allowed invasive species to gain a foothold. Here, we provide the results of a test designed to determine if this "vacant niche" allowed the establishment of invasive Eurasian milfoil (*Myriophyllum spicatum*) in the Mobile Bay estuary. Results from a field survey showed that community composition varies greatly with causeway location. Submerged aquatic vegetation (SAV) south of the causeway is dominated by native wild celery, while milfoil dominates to the north. Salinity is consistently lower north of the causeway than to the south. Thus, we performed an experiment which documented milfoil growth across a range of salinities recorded at the study site. Results suggest that salinity has no effect on milfoil growth ($p = 0.566$). A subsequent experiment showed that milfoil can not competitively exclude wild celery from the region either ($p = 0.427$). While we have not yet documented how milfoil became established, reanalysis of the field data suggests that wave action may limit milfoil proliferation to quiescent embayments north of the causeway. As such, we now hypothesize that the causeway provides a "vacant niche" through reduced physical disturbance, which has allowed milfoil to proliferate.

McGhee, Katie E., Florida State University. **The stability of male dominance status in the bluefin killifish** (animal behavior).

In species that form dominance relationships based on aggressive behaviour, an individual's momentary dominance status can affect immediate access to resources or potential mates. But if dominance status is to influence lifetime reproductive success and thereby contribute to the evolution of particular behaviours, it must be repeatable across individuals and replicable over time. I used dyadic interactions in a round-robin design to investigate the stability of dominance status among male bluefin killifish (*Lucania goodei*). Males formed linear dominance hierarchies that were remarkably stable over time even when males did not encounter one another for five weeks. Male rank was not associated with body size but was associated tightly with the

level of individual behavioral activity; males who emerged with higher ranks exhibited higher overall rates of behavior toward other males and females. The behavioral phenotype, as measured by overall activity level, was significantly repeatable at 0.485, which accounts for the stability of the dominance hierarchies. Males encountering one another a second time did not display shorter trial durations or lower levels of aggression in re-establishing the original dominance relationship. The stability of behavioral phenotypes and dominance ranks suggests that these phenotypes are inherent characteristics of individuals rather than short-term responses to recent social experience or daily levels of food or stress, and may potentially have a genetic basis.

McGregor, Anna E., Douglas Nowacek, Carolyn Angell, Michael Moore, Florida State University. **Is it a long way down? North Atlantic right whales (*Eubalaena glacialis*) change their behavior in response to increased buoyancy** (animal behavior).

Blubber thickness of North Atlantic right whales, *Eubalaena glacialis*, varies considerably based on the life history of these animals, affecting the energetic output necessary for locomotion because this tissue is positively buoyant. The free-ranging nature of these oceanic animals has prevented monitoring of their behavior and measurement of their body condition, but new technologies have made both of these measurements possible. This study compares the relative duration of active and passive phases of locomotion, measured with a remote archival tag, with the amount of buoyant tissue, measured with an ultrasound device, in individual free-ranging right whales. Animals with thicker blubber layers had shorter phases of active propulsion and longer phases of passive gliding than animals with thinner layers when surfacing from foraging dives. The maximum body pitch and rate of travel used during descent and ascent phases were also different between animals with blubber layers of different thickness. Right whales appear to make behavioral changes in response to increased positive buoyancy, enabling them to increase the duration of passive locomotion on ascent and decrease the energy actively spent on overcoming the buoyancy of their blubber on descent.

McNutt, David W., and Amber L. Lefstead, Florida State University. **The indirect, plant-mediated interaction between two specialist herbivores varies among host plant genotypes** (ecology).

Indirect competition between herbivorous insects may occur through the induced defense of a shared host plant. In these systems, genetic variation

among hosts in induced resistance could potentially shift the strength or outcome of interactions between herbivores. In this study, we investigated the potential for variation in the interaction between the specialist herbivores *Manduca sexta* and *Leptinotarsa juncta* across genotypes of their common host plant, *Solanum carolinense*. We found that the interaction between these herbivores varied between an amensalism and no interaction, depending on which genotype was considered. This is most likely due to interactions between the host's induced resistance type and the digestive physiology of the two herbivores.

Metzger, Genevieve, Fred Kraus, and Christopher Parkinson, University of Central Florida. **Historical biogeography of the New Guinea crowned snakes (Elapidae: *Aspidomorphus*)** (systematics).

The New Guinea crowned snakes, genus *Aspidomorphus*, comprise three species of small elapid snakes endemic to New Guinea and the surrounding islands. Here we address the biogeographic history of the species within this genus based on approximately 1100 base pairs of the mitochondrial cytochrome b gene and 1200 base pairs of a nuclear intron sequence. We sequenced 47 *Aspidomorphus* individuals and three outgroup taxa. Phylogenetic analyses using Bayesian methods were performed to determine evolutionary relationships of the three species within *Aspidomorphus* and to determine if there is phylogeographic structure among populations of *A. muelleri* and *A. lineaticollis*. Our analyses resulted in a well supported phylogeny that fully resolves the relationships between the three described species of *Aspidomorphus* and suggests phylogeographic structure in *A. muelleri* and *A. lineaticollis*. We use the phylogeny to suggest a biogeographic hypothesis of the radiation of crowned snakes across New Guinea.

Miller, Mary-Elizabeth C., and William M. Graham, University of South Alabama. **The influence of ecological and physical factors on the settlement and survivorship of the moon jelly (*Scyphozoa; Aurelia* sp.) in the northern Gulf of Mexico** (ecology).

Jellyfish blooms in the northern Gulf of Mexico broadly overlap with areas of low oxygen concentrations, such as the so-called "dead zone" of the Louisiana-Texas shelf. The ability of jellyfish to thrive in such altered habitats is a function of the entire life-history, including the pelagic medusa, planula larva, and benthic scyphistoma. To this end, we are investigating the relationship between low dissolved oxygen concentrations and the survival and growth of *Aurelia* sp. in the northern Gulf of Mexico.

We hypothesize that, under low dissolved oxygen conditions, scyphistomae have a competitive advantage within the benthic community. A set of laboratory experiments were conducted to evaluate the effect of dissolved oxygen on planulae settlement and scyphistomae viability. Greatest planula settlement rates occurred under lowest dissolved oxygen concentrations (1.3 mg/l), indicating that reduced dissolved oxygen promotes settlement perhaps as signal of physiological stress on planula swimming. The survival of scyphistomae under prolonged (55 days) hypoxic conditions decreased only marginally, however the rate of asexual budding was significantly reduced under these conditions. Benthic community assemblages were also significantly altered due to low oxygen conditions. Field experiments revealed increased survival of polyps in deeper, low oxygen waters compared to high oxygen surface waters. We believe tolerance to the physiological stresses of hypoxia and suspected reduction of competition and predation in hypoxic areas make these areas particularly susceptible to jellyfish recruitment and viability. The competitive advantages of jellyfish may be exacerbated if they occur in environments that are affected by anthropogenic impacts such as hypoxia.

Myers, Darryl, Florida State University. **Daniel Simberloff's ecological field experiments, 1969–1981** (history and philosophy of science).

Field biology, such as ecology, is often thought of as observational in contrast to the direct manipulation of test subjects that prevails in the laboratory. However, the career of ecologist Daniel Simberloff was largely built on performing experiments on species, ecosystems, and habitats in the field. I explore the significance of Simberloff's field experiments both in their contribution to theory (for example testing the predictions of the theory of island biogeography) and in the wider context of field versus laboratory practices.

Parnell, N. F., C. D. Hulsey, and J. T. Streelman, Georgia Institute of Technology. **Hybridization produces novelty when mapping of form to function is many-to-one** (evolution).

Two recent but separate lines of research are used to explain the origin of novel features and functions. The first invokes the model of transgressive segregation, where hybrid offspring exhibit trait distributions outside of the parental range. The second considers the explicit mapping of form to function and illustrates manifold paths to similar function (called many to one mapping, MTOM) when the relationship between form and function is complex. We fuse these research themes

by considering the influence of MTOM on the production of transgressive jaw biomechanics in simulated hybrids between Lake Malawi cichlid species. Notably, F2 hybrids are transgressive for function, but not the component traits that contribute to function. In our model, transgression is a consequence of recombination among alleles specifying the lengths of the lower jaw and maxilla. Our genetic model can be tested by breeding Malawi cichlid hybrids in the laboratory and examining the resulting range of form and function

Pathikonda, Sharmila, Azmy S Ackleh, and Susan Mopper, University of Louisiana, Lafayette.

Invasion, disturbance, and competition: modeling the fate of coastal plant populations (conservation).

Wetland habitats are besieged by abiotic and biotic disturbance such as invasive species, fragmentation, and salinization. Predicting how these forces will alter local population dynamics and community structure is a central challenge to ecologists. Using stage-structured matrix models, we examined the potential effects of abiotic disturbance on native blue (*Iris hexagona*) and invasive yellow (*Iris pseudacorus*) iris populations. Iris is an ideal model for testing these questions because of its clonal/sexual mating system and tolerance of diverse wetland conditions; comparing ecologically comparable iris congeners can help elucidate key life-history traits underlying demographic responses. Our models, parameterized with empirical data and field observations, predict dichotomous responses of native and invasive iris to salinity stress. Colonization of freshwater or brackish habitat by both species rarely led to coexistence. In 66% of freshwater marsh simulations, invasive iris populations excluded the native within 50 years. However, in 96% of brackish marsh simulations, the native species excluded the invasive within 25 years. Coexistence of species only occurred when we introduced periodic hurricane salt pulses into the freshwater marsh. Our results indicate that abiotic disturbance can limit the spread of invasives in some circumstances. As disturbances such as invasive species and salinization of habitat become more widespread, modeling can become a valuable tool in managing critical habitats and plant communities.

Petes, Laura E., and Alicia J. Brown, Florida State University. **Effects of salinity on Apalachicola oyster disease** (ecology).

The Apalachicola estuary in the Florida panhandle is under increasing threat due to reduced freshwater input from the Apalachicola-Chattahoochee-Flint River watershed. During summer 2007, a severe drought in the U.S. Southeast

led to low river flow and withholding of fresh water to supply residents of Atlanta, Georgia, with drinking water. High salinity in Apalachicola Bay led to die-offs of economically and ecologically important oyster (*Crassostrea virginica*) populations, probably as a result of both predation and disease. A tank experiment was conducted to determine the effects of salinity on oyster disease and mortality. Twenty oysters (10 large and 10 small) were randomly assigned to one of four different salinity treatments: 9 ppt, 17 ppt, 25 ppt, and 33 ppt (n = 4 tanks per treatment) at constant temperature. Growth, weight, and survival were measured weekly for five weeks. High mortality occurred in the high-salinity treatments (25 and 33 ppt) and was size-specific, with large oysters suffering much higher mortality than small oysters. At termination of the experiment, surviving oysters were examined for Dermo disease, caused by the protozoan *Perkinsus marinus*. Dermo analyses revealed high prevalence and severity of disease. Results of this study suggest that high salinity due to anthropogenic freshwater removal and drought could lead to increased oyster mortality due to disease.

Pinzone, Cheryl A., and Kenneth M. Fedorka, University of Central Florida. **Sex with strangers: effect of male ejaculate on female immune response in *Drosophila melanogaster*** (evolution).

The evolution of sex is such that there is a continual "tug of war" battle to outmaneuver the strategy of the other sex so that each sex may maximize its own fitness. In this sexual conflict, males can employ mating strategies that negatively affect females in the pursuit of maximizing reproductive success. In insects, a male strategy is to pass accessory gland proteins in their ejaculate that can not only manipulate a female's reproductive behavior but can even shorten her lifespan. Females may counter this tactic by upregulating their immune system to fight against these foreign proteins. Whether males are continually evolving ejaculatory proteins against female immunity can be tested based on predictions about the patterns of immune expression. We found in *Drosophila melanogaster* that females evinced the greatest immune response after mating to males from a distant location. Females did not respond as highly when mated with males of a closely related population, and showed the least response when mated to males of the same population. These results suggest that there is an antagonistic coevolution between male ejaculatory proteins and female immunity. It appears that females are better suited to overcoming the composition of ejaculatory proteins if they have coevolved with the males. Conversely, it appears

that males from more distant populations have evolved novel protein compositions with which females are unfamiliar, forcing females to allocate more resources into immunity. Moreover, these results have broader implications toward life history tradeoffs between immunity and reproduction.

Prieto-Márquez, Albert, Paul Gignac, Shantanu Joshi, and Gregory M. Erickson, Florida State University.

Testing the utility of osteological correlates purported to reflect sex in non-avian dinosaurs (functional morphology).

Gender in nonavian theropod dinosaurs has been inferred using attributes in the pelvic girdles and tail skeleton that are presumed to be sexually dimorphic. In theory, wider pelvic canals and shorter, more caudally positioned first chevrons in females act to facilitate the passage of eggs through the cloaca. In contrast longer, more cranially positioned first chevrons in males afford ample attachment area for the "penile retractor" musculature. The American alligator, *Alligator mississippiensis*, has for the most part served as the model taxon for these sexual phenotypes. Nevertheless, little or no quantitative data has been presented showing that these phenotypes truly exist. Here we used skeletons of wild-caught *A. mississippiensis* and the squamate *Iguana iguana* to test whether gender specific morphological differences truly exist in these dinosaurian outgroups. A preliminary sampling of 17 females and 19 males of *A. mississippiensis* and 13 females and 7 males of *I. iguana* were examined. Measurements of the pelvic canal area, dorsoventral height and mediolateral width of the pelvic canal, height between the dorsal edge of the ilium and the ventral border of the ischium, and lengths and positions of haemal arches 1 and 2 were made. Additionally, a new method of shape analysis (Geodesic Distance Analysis) was used to test for morphological differences in the pelvic canal. ANCOVA was used to compare these data. No significant correlation between sex and pelvic girdle morphology, chevron length, or position was found. Assertions that the osteology of pelvic girdles can indicate the gender of dinosaurs, was not supported.

Raut, Samiksha, and Robert Angus, University of Alabama at Birmingham. **Anal fin masculinization and vitellogenin inhibition as biomarkers of endocrine disruption in female mosquitofish, *Gambusia affinis*** (ecology).

Numerous studies, both in the field and laboratory, have demonstrated that a variety of anthropogenic compounds can act as endocrine disruptors. Recently, discovery of pharmaceuticals in

wastewater treatment plant effluent is raising a new environmental concern. Hence, there is a need to investigate the impacts of these compounds on aquatic organisms, particularly fish. Additionally, for accurate risk assessment it is necessary to determine whether these pharmaceuticals have similar effects in fish as in humans. Spironolactone (SPL) is a drug intended for human use, generally as a diuretic. It acts as an aldosterone antagonist and also exhibits anti-androgenic effects in humans. In this study, we examined the dose-dependent effects of SPL on secondary sex traits in female western mosquitofish, *Gambusia affinis*. Fish were exposed for five weeks to SPL at four concentrations: 10, 100, 250, and 500 nM, via water using the static renewal method. Morphological masculinization of females, as evidenced by development of an elongated and modified (with serrae and hooks) anal fin was observed in the three highest concentrations. Correspondingly, RT-PCR data show a dose-dependent inhibition of the estrogen-regulated vitellogenin gene expression in the SPL-treated fish. These results thus demonstrate both androgenic and anti-estrogenic modes of action of SPL in fish, quite in contrast to its anti-androgenic effects observed in humans. Additionally, these results support the use of anal fin masculinization and vitellogenin inhibition as useful biomarkers of endocrine disruption in female mosquitofish.

Robbins, T. R., J. N. Pruitt, L. E. Straub, E. D. McCoy, and H. R. Mushinsky, University of South Florida. **Transgressive behavioral traits of *Sceloporus* hybrids confer fitness through advantage in territorial defense** (evolution).

We investigated the territorial behavior and associated characteristics of *Sceloporus woodi*, *Sceloporus undulatus*, and their hybrids using paired lizard trials in the laboratory. Body size (SVL) and inherent aggression predicted best the outcome of territorial encounters. Mass, head-girth, and defender/intruder status played further roles within the SVL/aggression framework. We also detected two extreme phenotypes in this natural hybrid population, one morphological (greater head-girth) and one behavioural (greater inherent aggression). Furthermore, the extreme aggressive behavior exhibited by hybrids resulted in greater success in defending and invading territories against either parental species. The process through which hybrid organisms express phenotypes that are extreme relative to parental lines is transgressive segregation. Because hybrids have generally been thought to exhibit intermediate traits, transgressive segregation is a counterintuitive outcome of hybridization and can generate new and unexpected phenotypes on

which selection can act. These extreme phenotypes can promote speciation by increasing the potential for hybrid organisms to create new niches or to dominate existing niches through parallel selection pressures and divergent natural selection. This can result in hybrid speciation or introgression and extinction of the parental species. In particular, transgressive segregation has been implicated as a process through which homoploid, hybrid speciation can occur, but some form of ecological divergence is necessary to impede parental gene flow. That ecological divergence could manifest in territorial species through transgressive aggression.

Sandidge, Rebecca, and Marcus Griswold, University of Florida. **Logging riparian zones: impacts on epigaeic invertebrate communities** (ecology).

Riparian zones in forest watersheds are important habitats for invertebrates, supporting high species diversity and providing a transitional zone between aquatic and terrestrial environments. Vertebrates and aquatic invertebrates are often the focus of forest disturbance studies; however, epigaeic invertebrates are relatively understudied despite their vital role in nutrient cycling, food webs, and soil maintenance. Pitfall traps were used to sample epigaeic invertebrates in forested, reference watersheds and watersheds impacted by forestry practices. Impacted watersheds were clearcut, leaving a 40–70 foot riparian buffer zone in the downstream reach and selectively removing 50 percent of the basal area in the upstream portion. The data were used for comparison of species diversity, abundance, species composition, and feeding guild composition. Harvested watersheds were sampled streamside (0 m), at the buffer edge (10 m), and outside of the buffer zone (20 m); forested sites were sampled at equivalent distances. Forested sites had higher species diversity, significantly different species compositions, and a higher ratio of predators and detritivores. Clearcut sites had higher ratios of herbivores and omnivorous, generalists. Detrended correspondence analysis linked changes in community composition to key resources including canopy cover, leaf litter, and exposed soil. Data suggests selective harvest does not impact epigaeic invertebrates while the larger impact of clearcutting has a significant impact on community structure. Results imply that buffer zones larger than the 40–80 foot size requirement may be necessary to preserve invertebrate communities and current management guidelines may require reassessment.

Sargent, Lindsey, Stephen Golladay, Alan Covich, Stephen Opsahl, and Amy Rosemond, University of Georgia. **Invasion success of a nonnative crayfish** (ecology).

Examining species invasions can provide insight into ecological and evolutionary processes. We examined the distribution of a native crayfish, *Procambarus spiculifer*, and a nonnative crayfish, *Orconectes palmeri creolanus*, within the lower Flint River Basin, Georgia. Crayfish abundance was estimated by surveys of 26 sites in the Flint River and its tributaries. Within the Flint River, the relative abundance of the two species varied from upstream to downstream. *O. palmeri* was found almost exclusively at upstream sites, while *P. spiculifer* was more abundant downstream. *O. palmeri* collected downstream were larger than those collected at upstream sites, suggesting little recruitment of *O. palmeri* downstream. Within tributaries, only native crayfish were observed. To examine these trends, we are collecting physical and chemical data throughout the study area. In addition, we are assessing the consumption of the two crayfish species by native and exotic fish predators. These data will provide a possible mechanism for invasion success as well as examples of predator prey relationships that differ due to whether or not the species coevolved. Understanding the mechanism that allows *O. palmeri* to be a successful invader in some areas, but not others, may assist in predicting the future invasion potential of this species.

Savage, Amy M., Kenneth Whitney, and Jennifer Rudgers, Rice University. ***Anoplolepis gracilipes* invasion of the Samoan Archipelago: can mutualisms with native species amplify ecological impacts** (ecology).

Studies that explicitly test the role of mutualisms in community dynamics are largely lacking in the ecological record. However, these interactions are likely to be important to community structure. They are abundant and widespread, include multiple species from different trophic levels, and occur simultaneously with antagonistic interactions. Therefore, integrating mutualism into the study of ecological communities is likely to be critical to our ability to understand community-level dynamics and predict the consequences of anthropogenic change. Invasive species are among the greatest of these threats to global biodiversity. Tropical islands support high levels of endemism, making them especially vulnerable to invader impacts. For these systems, invasion of the yellow crazy ant (YCA, *Anoplolepis gracilipes*) is of particular concern. Identified by the International Conservation Union as one of the world's 100 worst

invaders, this species has already decimated some tropical island ecosystems. In Samoa, YCA associates with native plants bearing extrafloral nectaries. I am investigating the ecological mechanisms that underlie YCA success in Samoa, examining impacts of the invasion on indigenous communities, and explicitly testing how community dynamics, specifically novel mutualisms with native species, may feed back to influence the invasion. In this talk I will present data from coarse-scale surveys, short-term behavioral experiments, and preliminary findings from an ongoing community-level manipulative experiment.

Schrader, Matthew, and Joseph Travis, Florida State University. **Testing the viviparity conflict hypothesis: parent-offspring conflict and the evolution of reproductive isolation in a poeciliid fish** (evolution).

The evolution of viviparity and postfertilization maternal investment increases the potential for genomic conflicts between mothers and offspring over the level of maternal investment. One possible consequence of such conflicts is the acceleration of the evolution of reproductive isolation between populations with divergent mating systems due to a mismatch between offspring demand for maternal investment and maternal resistance to this demand. We tested this so-called viviparity conflict hypothesis using crosses between conspecific populations of a highly matrotrophic poeciliid fish that differ in their level of polyandry. Our results support the critical prediction of an asymmetry in the rate of spontaneous abortion in reciprocal crosses between populations with different mating systems: the rate of spontaneous abortion was highest in crosses between females from a relatively monandrous population (monandrous females) and males from a relatively polyandrous population (polyandrous males). However, the patterns of offspring size that we observed were not consistent with the pattern predicted by the viviparity conflict hypothesis: crosses between a monandrous female and a polyandrous male did not produce larger surviving offspring than the reciprocal hybrid cross. Instead we found that polyandrous females produced larger offspring than monandrous females. In addition, offspring size was positively correlated with maternal size in crosses involving a polyandrous male. There was no such correlation in crosses involving a monandrous male.

Scyphers, Steven B., Sean P. Powers, Kenneth L. Heck, Jr., and Carly S. Steeves, Dauphin Island Sea Lab/University of South Alabama. **Shoreline stabilization and fisheries benefits of oyster reef restoration in coastal Alabama** (conservation).

Shorelines at the interface of marine and terrestrial biomes are one of the most degraded and threatened habitats in the coastal zone because of their sensitivity to sea level rise, storms, and increased utilization by man. Previous efforts to restore shorelines have largely involved introducing unnatural structures to dampen wave energy. Recently, restoration efforts have shifted towards biogenic, or "living reefs." Beyond shoreline stabilization, living reefs may provide additional ecosystem services such as habitat for resident species of shellfish and finfish, providing feeding resources for transient fishes, and improved water quality via the filter-feeding bivalves. Currently, a large-scale bioengineering restoration project is being undertaken by the University of South Alabama and the Dauphin Island Sea Lab. This "living breakwater" project involves construction of four networks of reefs (each with three 5 × 50 m reefs) in close proximity to eroding shorelines in coastal Alabama. We hypothesized that over time the presence of eastern oyster (*Crassostrea virginica*) reefs could stabilize and possibly facilitate the expansion of shoreline marsh grass as well as provide habitat for additional fishes. Our preliminary results support our hypothesis that created oyster reefs will be utilized by transient fishes and provide substrate for oyster reef recruitment.

Sheehan, Kate, Just Cebrian, and Jack O'Brien, University of South Alabama/Dauphin Island Sea Lab. **Distribution of parasite assemblages of grass shrimp in Mobile Bay** (conservation).

The common grass shrimp (*Palaemonetes pugio*) is a common prey species to economically and ecologically important fishes and crustaceans in estuarine habitats. *P. pugio* is host to a number of obligate, facultative, and transient symbionts. A survey including 22 sites was conducted around Mobile Bay, Alabama, during the winter (January), spring (May), and summer (September) of 2007 to determine the general prevalence and distribution of *P. pugio* parasite taxa. Here we report on obligate parasites that are easily observed on or within live *P. pugio* (microphallid trematodes, haplosporidian hyperparasites, loricate ciliates, and bopyrid isopods) with the aid of dissecting microscope. Overall abundance and frequency of all parasites was compared among seasons and parasite assemblages were analyzed using multivariate techniques. Results indicate parasite frequency does not change

seasonally, however seasonal changes in parasite assemblages are common. Our results help develop a better understanding of the natural history of these organisms which is critical for the development of further studies where *P. pugio* is a key trophic intermediate. Ultimately, this research addresses the nature and ecological implications of the interactions between *P. pugio* and its parasites.

Smiley, Sarah A., Earl McCoy, and Henry Mushinsky, University of South Florida.

Prospecting for gold: sampling problems, habitat, and population dynamics of golden mice (*Ochrotomys nuttalli*) in south-central Florida (ecology).

The golden mouse (*Ochrotomys nuttalli*) is a semiarboreal small mammal species that occurs throughout the southeastern deciduous hardwood and pine forests. Although this species occupies a relatively wide geographic range, it is not commonly captured in Sherman live traps. Low capture rates of golden mice may be caused by their fairly specialized habitat preferences, small home range size, initial reluctance to enter traps, arboreal tendencies, or true rarity. However, in south Florida where trees remain evergreen and ground-nesting is common in some habitats, winter nest searching techniques utilized in northern areas can prove less fruitful than live trapping. With these sampling problems in mind, this project examines the results of over six months of trap data from a south-central Florida population of *O. nuttalli*. Captures of golden mice were concentrated in an area of overgrown palmetto-oak scrub. Adult *O. nuttalli* exhibited little movement and a high degree of site fidelity over the sampling period. Capture rates of golden mice were relatively low, but show a distinct peak in late winter (February–March) when juveniles entered the population. Winter breeding is also supported by the body mass and reproductive body condition of females during this time frame. This research corroborates with data from other studies which describe a winter breeding season in southern populations of this small mammal.

Sterrett, Sean C., Lora L. Smith, Stephen W. Golladay, Sara H. Schweitzer, and John C. Maerz, Warnell School of Forestry and Natural Resources/Joseph W. Jones Ecological Research Center. **Evaluating riparian disturbance and their influence on aquatic turtles in the Lower Flint River Basin, Georgia** (conservation).

Agriculture has been a major part of the economy in southwest Georgia, but this large-scale land use has also had many negative effects on terrestrial and aquatic habitats. Although limited data

exist, some known effects include sedimentation, chemical leaching, edge effects and most notably habitat conversion. Freshwater turtle communities are among many groups of wildlife that may be impacted by agricultural disturbance to riparian habitats. Sedimentation and pollution from agriculture may negatively impact riverine turtles by reducing the abundance of invertebrate prey, and the clearing or thinning of forests near rivers may reduce the availability of logs needed for shelter and basking. The objective of this study will be to assess species richness and abundance of freshwater turtles in both unimpacted or restored and agriculturally-impacted tributaries of the Lower Flint River Basin (LFRB). Aerial photography and random site selection has been used to choose appropriate sites for sampling. Two methods of capture, aquatic hoop traps and effort-managed snorkel surveys, will be employed to sample all known species. During the summer of 2007, we made 349 captures of 301 individuals representing eight turtle species along 3.5 kilometers of Ichawaynochaway Creek. Preliminary results of seven sampled reaches have shown differences in capture abundances of yellow-bellied slider (*Trachemys scripta*) and Barbour's map turtle (*Graptemys barbouri*) when considering the amount of riparian disturbance. This research will add to knowledge of the influences of landscape scale disturbances on turtle community ecology and conservation.

Swain, Timothy D., Florida State University.

Phylogeny-based species delimitations: novel alignment of hypervariable nucleotide sequences results in phylogenies concordant with morphology (molecular).

The precise and repeatable identification of species as independent units of evolution is necessary for any assessment of the structure and evolution of biological systems; particularly in symbiotic systems where specific interactions strongly influence the fitness of species. Symbiotic zoanthids (phylum Cnidaria, class Anthozoa, order Scleractinia) form associations with at least five different phyla and have global geographic and bathymetric distributions; however, the simple morphology of zoanthids challenge our ability to differentiate between intra- and inter-specific variation, and endemic and cosmopolitan species. The internal transcribed spacer (ITS) region of the ribosomal RNA nuclear gene was amplified from zoanthids collected from 10 different locations throughout the wider Caribbean region. Hypervariable ITS sequences provide highly informative molecular markers, but are not often fully exploited because of difficulties in sequence alignment. Rather than discarding difficult-to-align

hypervariable regions, I retained all nucleotides by treating blocks of unambiguously aligned sequence as if they were separate genes in a concatenated multi-gene alignment with incomplete taxon sampling for each gene. Sequence alignments were subjected to maximum-likelihood and Bayesian phylogenetic analyses and species were assessed by applying a history-based phylogenetic species concept to the resulting topologies. Phylogeny-based species delimitations have strong concordance with morphologically-defined species and reveal additional species that were not previously recognized.

Sylvester, Jonathan B., Gareth J. Fraser, and J. Todd Streebman, Georgia Institute of Technology. **Cichlid brain diversity develops at the boundaries (evolution).**

The cichlids of Lake Malawi have undergone rapid diversification in the past million years. For this reason, they represent a great system for studying the processes of differentiation that lead to speciation and morphological novelty. Malawi cichlids exhibit a wide range of phenotypes in all morphological characters, such as dentition and jaws. Their brains are highly variable as well, although these have been less studied. Variation has been observed in four major structures of the brain: the optic tectum, telencephalon, cerebellum, and hypothalamus. We first demonstrated significant differences among adults of multiple species in the volume of the four structures. Next, we used whole-mount in situ hybridization with gene markers for the three major developing regions of the brain, the forebrain, midbrain, and hindbrain, and their boundaries. Cichlid embryonic brains exhibit variation in the expression of patterning genes between species in the forebrain, which develops into the telencephalon and hypothalamus, and the midbrain-hindbrain boundary, which separates the optic tectum and cerebellum. These data suggest that developmental adjustments in gene deployment during the establishment of regional boundaries, promotes a vast diversity of brain morphology among Malawi cichlids.

terHorst, Casey P., and Thomas E. Miller, Florida State University. **Prey rapidly adapt to predation in pitcher-plant inquiline communities (evolution).**

Evolutionary rates are generally assumed to be slow and have little influence on community structure relative to ecological processes, such as competition and predation. Yet rapid evolutionary rates have been observed in a variety of communities and may be particularly likely to occur in natural microcosms. In such communities, evolutionary

change could significantly modify the effects of ecological processes. We collected *Colpoda* sp., a ciliated protozoan, from natural pitcher plant inquiline communities and exposed replicate populations to selection by a larval mosquito predator for over 20 generations (one week). Both selected and control populations were then grown under common conditions without a predator. Population growth rate of the prey increased significantly when compared to control populations, likely due to evolution of the rate of cell division in the protozoa. Genotypes with increased division rates are less susceptible to local extinction due to predation. Selected populations also demonstrated a decrease in average cell size, a trait consistent with increased predator tolerance. When grown under common conditions with a predator, the overall effect of predation was significantly lower in selected lines than in controls. Because of the similarity of time scales on which ecological and evolutionary processes occur, evolution in a prey species may ameliorate ecological effects due to predation. This demonstrates that the convergence of ecological and evolutionary rates has important effects that can influence community structure.

Toups, Melissa A., Aida T. Miro, and David L. Reed, University of Florida.

Do modern humans have lice from archaic hominids? (evolution).

Anthropoid primates have coevolved and cospeciated with ectoparasitic lice for the last twenty-five million years. Because lice evolve more rapidly than their hosts, they record more detailed historical information. In this study, we use the population genetic structure of *Pediculus humanus*, the human head louse, to explore host evolutionary history. Human mitochondrial data shows an expansion 100,000 years ago, which is also evident in louse mtDNA. However, one striking difference between human and louse mtDNA is the human mtDNA coalesces to a single lineage rapidly (within ca. 100,000 years), whereas louse mtDNA lineages date back to the origin of the genus *Homo* (ca. 2 million years ago). Two hypotheses have been put forth to explain this phenomenon, (1) the founding populations of modern humans leaving Africa carried at least three distantly related louse lineages into the present population, and (2) archaic hominids carried louse lineages that persist today due to host switching events. To test each of these hypotheses we simulated sequence data in a coalescent framework under each scenario to determine which is more likely to produce the louse gene tree.

Weese, David A., and Scott R. Santos, Auburn University. **Genetic identification of source populations for an invertebrate in the aquarium trade** (conservation).

Increasingly, managers are turning to molecular genetics to aid in conservation efforts. While such "wildlife forensic" approaches have focused on large terrestrial and aquatic vertebrate species, their application to other traded organisms has not been extensively explored. Here, we examined the utility of these techniques for identifying source populations of aquarium ornamental invertebrates, utilizing members of the Hawaiian shrimp, *Halocaridina*, as a study system. These shrimp, restricted to anchialine habitats of the Hawaiian Islands, are popular in the aquarium trade due their ability to survive in hermetically sealed containers for extended time periods. However, commercial harvesting may lead to the depletion/extinction of populations. Based on the distribution of anchialine habitats across the Hawaiian Islands, we hypothesized that commercially available *Halocaridina* originate from populations in the land district of Kona, along the west coast of the island of Hawai'i. Mitochondrial gene sequences from 96 individuals were compared to a large database of homologous sequences from previous studies. Bayesian clustering assigned specimens to either the Kona, Ka'u (west and south coasts, respectively, Hawai'i), or Kinau (south coast, Maui) genetic groups of these shrimp. Although some individuals originated from the Kona land district as hypothesized, our finding that commercially available *Halocaridina* are from three genetic groups spanning two islands suggests that other populations also warrant management consideration. While this study represents the first application of molecular genetics in identifying source populations of aquarium ornamental species, we feel that these techniques are amenable more broadly since they are dependent on only a few caveats.

Wiens, Karen, and Susan Mopper, University of Louisiana at Lafayette. **The ecological implications of temperature and salinity for a native and nonnative iris in coastal Louisiana** (ecology).

Iris pseudacorus is native to Eurasia and is listed as an invasive species in 43 of the lower 48 states. It is a freshwater plant that tolerates high salinities and is known to grow in salt marsh habitats in both its native and invasive ranges. *I. pseudacorus* shares habitat requirements and environmental tolerances with a Louisiana native, *I. hexagona*. Despite its long term popularity as a landscape plant, *I. pseudacorus* does not appear to have established in

marsh environments of Louisiana. A previous experiment found that salinity negatively impacted the performance of *I. pseudacorus* seedlings and a pilot study showed that when *I. pseudacorus* rhizomes established in a common garden experienced a salinity treatment of 8 ppt, they experienced strong mortality. These findings are at odds with published tolerance data for *I. pseudacorus*, and led to the hypothesis that elevated salinity in combination with Louisiana's high summer temperatures may negatively affect *I. pseudacorus*. Growth chambers were used to test this hypothesis. We found that neither temperature nor salinity affected the early establishment of rhizome fragments. At low salinity, we found a significant species effect, where *I. pseudacorus* grew faster than *I. hexagona*. We also found a significant time effect as well. At higher salinity we found a species by time interaction. These results were unexpected and suggest that the timing of a disturbance event leading to the fragmenting and dispersal of rhizome fragments could determine the establishment success of fragments of native and invasive iris in coastal wetlands.

Wilkie, Jacquelyn, College of Charleston. **Spacial and temporal characterization of the surf zone macrofauna at Folly Beach, South Carolina** (ecology).

The fish assemblage within the surf zone is widely variable consisting of a large number of individuals which represent a small number of species. Although a few species in the surf zone in the South Atlantic Bight have been well studied, data are lacking for most species, especially fishes. A study is being conducted in conjunction with a study of the surf zone in Horry County, South Carolina, which has a history of hypoxic events. The study conducted on Folly Beach is being used to evaluate long term changes to the macrofauna in the surf zone by comparing findings to studies conducted from 1969 to 1971, and 1980. A 19.8 m by 1.8 m, 9 mm bag seine is pulled through the surf zone parallel to the shore for 100 m at two sites 0.5 km apart. Samples are taken biweekly within one hour of low tide in the morning from June 2007 to August 2008. After the seine is beached, each specimen is preserved, then measured and weighed. Before each seine haul, the following physical measurements are taken: turbidity, temperature, salinity, percent dissolved oxygen, and concentration of dissolved oxygen. Data collected will be analyzed to compare species richness and abundance between counties as well as between seasons. Abundant species will be used in additional analysis to examine any correlations between abundance or biomass and any of the physical measurements.

Poster Presentation Abstracts

1. Abernathy, Jason W., Jianguo Lu, Zhenxia Sha, and Zhanjiang (John) Liu, Auburn University.
Complement control factor I in the channel catfish (*Ictalurus punctatus*) is conserved through teleost evolution (molecular).

The complement system in vertebrates plays a key role in host defense by promoting inflammation and stimulating an immune response. Complement control factor I (CFI) is a serine protease that regulates complement activation through proteolytic activity. This protein is responsible for cleavage of both third (C3b) and fourth (C4b) components of the complement system. Thus CFI regulates the complement activation cascades in both the alternative and classical pathways, at the C3 and C4 steps, respectively. Host regulation is crucial, since CFI functions in both innate (alternate pathway) and acquired (classical pathway) immunity. To date, research on CFI genes in teleost fish has been limited. Using degenerate and zebrafish primers, we discovered a partial CFI sequence in the channel catfish. BLAST tools at the NCBI website were used to confirm the identity as CFI. We further obtained the complete primary sequence of the CFI gene from mRNA by sequencing full-length cDNA. Alignments of both nucleotide and amino acid sequences were made from RefSeqs and UniGenes of various other species available at the NCBI. Through phylogenetic analyses, we observed that the catfish CFI domain and deduced amino acid sequence is highly conserved with the common carp CFI, and with zebrafish and *Tetraodon* predicted proteins. Further analyses suggest good conservation with other vertebrate species as well, including humans. Our finding that catfish CFI is conserved in evolution is consistent with various other genes involved in the complement pathways and vertebrate host immunity. A discussion and figures will be presented in the poster.

2. Antwi, Josephine, and Janice Bossart, Southeastern Louisiana University.

Influence of forest fragmentation on the genetic diversity of nymphalid butterflies (molecular).

Species inhabiting fragmented forests are isolated at different degrees preventing gene flow between forests. Progressive inbreeding among these species leads to genetic drift with consequent loss of genetic diversity. The impact of fragmentation will be analyzed using three nymphalid (fruit-feeding) butterfly species, *Euphaedra medon* (strictly forest

dwelling), *Aterica galene* (strictly forest dwelling), and *Gnophodes betsimena* (could be found both in forest and outside forests) in some semi-deciduous forests of Ghana. Genetic diversity within and between populations of these species will be analyzed for using MtDNA cytochrome oxidase I (COI). Butterflies were sampled from seven isolated forests (sizes between 6 and 5000ha) including sacred groves (forests reserved by local communities). Therefore, it is expected, in this study, that genetic diversity within the populations in each forest fragment will be low due to absence/less gene flow and the influence of genetic drift. However, species in forest fragments relatively close to each other will indicate much higher genetic diversity due to possible gene flow especially by *G. betsimena*, if it is able to move through matrices such as farms and cocoa plantations that surround these forests. These forests fragments are under threat because they are still reducing in size due to human activities. The goal of this study is to recommend conservation measures for these small to medium sized-forests to secure/maintain genetic variability and the long-term survival of their biodiversity.

3. Aschliman, Neil C., Florida State University.
Molecular phylogeny of stingrays and allies (Batoidea: Myliobatiformes) using nuclear and mitochondrial DNA sequence data (systematics).

The order Myliobatiformes (Chondrichthyes: Batoidea) comprises 10 families and approximately 175 species of stingrays and pelagic rays. This group circumscribes a broad range of morphological disparity, from *Urotrygon microphthalmum*, a diminutive stingaree with a disc width of only 15 cm, to the seven-meter wide planktivorous *Manta birostris*. Myliobatiforms have been morphologically well characterized, but there remain numerous points of contention between studies. A molecular phylogenetic analysis of myliobatiforms was conducted to provide a framework for understanding the apparent evolutionary changes in their morphology and ecology. The myliobatiform radiation dates to the Cretaceous through Eocene, so a slowly evolving nuclear gene was expected to optimally resolve the clade. Recombination activating gene 1 (RAG-1) was chosen because it exhibits desirable properties in sharks and rays for phylogenetic analysis. This nuclear locus was complemented by NADH dehydrogenase subunit 2 (ND2), a faster-evolving mitochondrial protein-coding gene that is useful for

resolving closely related taxa. Genes were analyzed separately and combined for a number of myliobatiforms under Maximum Likelihood and Maximum Parsimony approaches. While unable to fully resolve the interrelationships of myliobatiforms and their allies, the ND2 and RAG-1 data sets agreed upon a number of well-supported clades. Some are novel, while others are anticipated by morphology.

4. Begnaud, Les, Jesse Castille, Brandon DeJean, Grant Guidry, and Caleb Williams, University of Louisiana at Lafayette. **Effects of natal habitat and salinity on *Iris hexagona* populations** (ecology).

Many restoration projects fail because habitat conditions, ecological factors, and population dynamics are poorly understood. Preliminary experimental studies on potentially influential variables could improve the outcome of these large-scale and costly activities. The empirical data can be combined with mathematical models to make more intelligent management decisions. Our project used a common garden experiment and stage-structured matrix models to examine the influence of natal habitat and salinity on the performance of a native wetland species, *Iris hexagona*. In the freshwater treatment, plants collected from brackish habitats had a lower initial biomass but a higher relative growth rate compared to plants collected from freshwater wetlands. Our model integrates results from the common garden experiment and previous field studies to predict iris population growth. Although initially smaller in size, irises from brackish marsh produced larger populations than freshwater plants within five to fifteen years. Climate change is increasing both sea level and environmental salinity in many coastal wetlands. These inevitable abiotic changes should be considered when restoring damaged habitats; plants that are best adapted to them should be selected whenever feasible. Restoration decisions can be improved by integrating field experiments and mathematical models.

5. Bush, Brienne, Vericka Johnson, and Aditi Pai, Spelman College. **Polyandry and its fitness consequences in the confused flour beetle, *Tribolium confusum*** (evolution).

Little is known about the mating behavior of the confused flour beetle, *Tribolium confusum*. However, extensive research has been completed on the mating behaviors of the red flour beetle, *Tribolium castaneum*; a closely related species of the confused beetle. The objective of this study was to measure the extent of female multiple mating behavior among *T. confusum* females and determine whether multiple mating behavior increased female fecundity. Accordingly we observed the mating

behavior of females and compared fecundity of singly and multiple mated females. We predicted that females would exhibit increased fecundity benefits due to multiple mating behavior. Based on preliminary experiments we found that females of the confused flour beetle sometimes mate with multiple partners. The fitness effect of multiple mating on female fecundity and egg-to-adult survival of eggs will be discussed.

6. Cannon, Johanna T., Amanda L. Rychel, Billie J. Swalla, and Kenneth M. Halanych, Auburn University. **Molecular phylogeny of Hemichordata** (systematics).

Resolving phylogenetic relationships within Hemichordata is important for understanding the early evolution of the deuterostomes, including characters of the last common deuterostome ancestor. At present, Hemichordata is divided into two classes, the solitary, free-living Enteropneusta worms, and the colonial, tube-dwelling Pterobranchia. These taxa, which have very different larval and adult body plans, have been central to hypotheses of deuterostome evolution. Previous molecular phylogenetic studies of hemichordates using 28S rDNA data or 18S rDNA data have suggested that enteropneusts are either monophyletic or paraphyletic, respectively. Here, we expand the number of hemichordate taxa in phylogenetic analyses using 18S rDNA data and employ more quickly evolving mitochondrial gene sequences. Preliminary data show enteropneust families as two distinct monophyletic clades, with the colonial pterobranchs in between them. The deep-sea spaghetti worm *Saxipendium coronatum* is shown to be a member of Harrimaniidae. Novel data from an undescribed deep-sea enteropneust species similar to *Torquarator bullocki* and a Gulf Stream tornaria larva suggest that these taxa are within the Ptychoderidae. Implications of these phylogenetic results for the evolution of deuterostome body plans will be discussed.

7. Dittler, Matthew J., and Robert H. Jones, Virginia Polytechnic Institute and State University. **How do root-feeding insects alter fine root dynamics in oak-dominated forests of southern Appalachia?** (ecology).

The turnover of fine root biomass is a substantial carbon flux, accounting for over fifty percent of net primary production in most terrestrial ecosystems. Because insect herbivores consume fine root tissue, they may play a significant role in root turnover dynamics. In this study we assessed the influence of naturally occurring densities of root-feeding insect assemblages on fine root productivity

by using an ingrowth core method to quantify fine root biomass production with and without an insect removal treatment (Lorsban?). Here we summarize data on insect larval densities collected during ingrowth core installation (summer, 2006) and harvest (summer, 2007), and the fine root production data from the ingrowth core experiment. Contrary to our predictions, herbivore exclusion did not have a statistically significant, negative effect on average fine root length or fine root biomass production. Rather, effects of herbivore exclusion on fine root productivity varied in direction and intensity depending on the location of sample plots. We found no correlation between inorganic nitrogen availability and the effects of the herbivore treatment on root productivity. Our results are in contrast to a similar study by Stevens and Jones (2006) in a longleaf pine, wiregrass system. We think that plant community composition might explain this discrepancy because herbivores may have foraging and oviposition preferences for certain vegetation types due to differences in the ways they defend their roots against herbivores. We are currently developing a suite of experiments to test this hypothesis.

8. Ferrara, C. L., and F.M. Harper, Rollins College. **Potential hybridization between the lizards *Anolis sagrei* and *Anolis carolinensis* in the Floridian peninsula** (evolution).

Both *Anolis carolinensis* and *A. sagrei* are small, subtropical, diurnal lizards that share a common evolutionary ancestor on the island of Cuba. Lizards within the genus *Anolis* are model organisms for studying factors that drive speciation because island colonization and niche segregation has lead to over 150 extant species radiating throughout the Caribbean islands. *Anolis carolinensis* is the only anole native to the United States, but in the last 40 years *A. sagrei* has been introduced throughout the Florida peninsula by accidental transport in cargo and produce from the Bahamas and Cuba. In this study, I use species morphology and genetic evidence to investigate the possibility of hybridization between these two species of *Anolis* lizards in secondary contact. Six locations in Florida where both lizards occur were chosen as collection sites. Lizards were captured by hand, photographed and assessed for 35 diagnostic characteristics. In total, 221 lizards were captured and tissue was sampled from the tails of 61 individuals for genetic analysis. Principal components analysis of 35 diagnostic characteristics revealed two distinct clusters of anoles, each pertaining to the defined species. One individual out of the 221 collected lizards had a mixed phenotype and may be of hybrid origin. Genetic work is currently ongoing using an mtDNA marker (COI) to

further describe the possibility of hybridization based upon genotypes.

9. Fort, John, Florida State University. **Does the species identity of competitors influence reproductive fitness in *Solanum carolinense*?** (ecology).

Individual plants within a community compete for limited resources in order to maximize growth and reproductive fitness. How does the identity of a plant's competitor affect that plant's performance? Niche theory predicts that plants with more similar resource needs compete more strongly. Following this thinking, conspecific competitors should reduce a target plant's fitness more than non-conspecific competitors. The neutral theory of biodiversity, on the other hand, predicts that a target plant's fitness should be equally reduced by competition from any other plant, regardless of species. We observed the effect of different plant competitors on the reproductive fitness (measured as seed production per plant) of *Solanum carolinense*. Increased percent cover of neighbors from many species (including other *S. carolinense*) did not affect seed production. On the other hand, increased percent cover of one particular neighbor (*Sida spinosa*) was associated with decreased seed production. These findings support one aspect of niche theory (plants compete differently with different neighbors), but are inconsistent with the idea that intraspecific competition must be greater than interspecific competition.

10. Gentry, Jacqueline, and Rosanna Cappellato, Rhodes College. **Carbon storage and sequestration of urban parks in Memphis, TN** (conservation).

Based on Earth Day Network data from 2002, the city of Memphis, TN, releases an estimated 64 million tons of anthropogenic CO₂. This study aimed to observe the amount of carbon sequestered in Memphis parks and to compare this value to the amount of carbon dioxide emitted by the city. We collected data from 35 urban parks, covering 690 ha of treed area. We measured tree area coverage in parks with Google Earth Pro and used the results of a recent study done in a Memphis urban park, to calculate the total value of carbon stored and sequestered. We estimated that parks store 41,000 MtC and sequester 6% of the carbon dioxide annually released by Memphis. However, because an aerial coverage map does not provide an accurate measurement of the tree biomass and may not reflect the most recent changes in the parks, we additionally surveyed two parks to determine the degree of difference between the actual treed areas and those inferred from the aerial image. These measurements

indicated that values based on aerial images underestimated the amount of carbon stored and sequestered by up to 77%, further underscoring the ecological relevance of Memphis parks as contributing to the reduction of anthropogenic CO₂.

11. Gornish, Elise, and Thomas E. Miller, Florida State University. **Use of census data to inform and implement restoration of coastal dune vegetation** (ecology).

Coastal regions along the Gulf of Mexico provide vital habitat for an array of wildlife, including several threatened and endangered species. The vegetation and geomorphology in coastal areas are interlinked: the landscape determines which plants can become established, while the plants reciprocally act to stabilize sands and sediments. Climate can affect both vegetation and morphology, although the long-term effects of climate are not well understood. Understanding how the vegetation and geomorphology respond to storms and predicted climate change will be necessary to effectively manage coastal areas. This has become particularly evident due to recent storms such as Hurricanes Ivan (2004), Dennis (2005), and Katrina (2005). We have censused the vegetation on permanent plots on St. George Island in northern Florida annually since 1999. Vegetation patterns across sites and years has been analyzed using detrended correspondence analysis (DCA). Correlations between vegetation change and climate for the last 8 years demonstrate that the vegetation of island habitats is affected by a variety of climate events. Vegetation on foredunes is most affected by tidal surge and flooding associated with major storms, while interdune areas are most affected by both surge and spring temperatures and backdune areas by spring drought. The census was used to identify six plant species that are either resistant to storm effects or respond positively following storms: *Centella asiatica*, *Fimbristylis* spp., *Muhlenbergia capillaris*, *Schizachyrium littorale*, *Sporobolus virginicus*, and *Uniola paniculata*. Individuals of these six species have been transplanted into fore-, inter-, and backdune habitats and are being monitored bi-monthly for survival and growth. These transplant experiments will test the prediction that these species may be useful for restoring damaged coastal areas. Results of this work will help local, regional and national reserve managers to implement efficient and cost-effective methods of management and restoration to ameliorate the effects of climate change on dune habitats. In the future, we are interested in determining whether the predictions of vegetation change on St. George Island can be extrapolated over a wider scale using ground-based spectral data along

with satellite and aerial imagery. As a first step, we are comparing the known vegetation changes on St. George Island with vegetation on nearby Cape George Island to determine the extent to which vegetation patterns can be extrapolated to nearby areas using remote sensing technology.

12. Grinath, J. B., Florida State University. **Mutualistic repercussions: consequences of ant/membracid interactions for an herbivorous beetle and the host plant** (ecology).

Pairwise species interactions that result in the exchange of benefits to individuals of both species are termed mutualisms. The interactions between ants and honeydew-producing homopterans have proven popular study systems, but the community-level impacts of these relationships remain poorly understood. To explore the direct and indirect community relations of this type of mutualism, I conducted an experiment in 2007 with a species of ant (*Formica obscuripes*), a honeydew-producing membracid (*Publilia modesta*), an herbivorous beetle (*Monoxia* sp.) and the perennial host plant that these insects interact upon (*Chrysanthamnus viscidiflorus*). Ant presence/absence treatments were crossed with three beetle abundance manipulations on individuals of *C. viscidiflorus* in a fully factorial design using 15 replicate ant colonies. The data indicate that ants reduced herbivory of the beetle on the hostplant, but that such a benefit is not apparent among floral measures. Membracids are positively associated with ant tending throughout all developmental instars. The effect of the ant on the host plant remains unclear and requires further study of the herbivory by the membracids and larval beetles.

13. Hale, Rebecca E., and Joseph Travis, Florida State University. **A comparative study of parental care and life history evolution in birds** (animal behavior).

If altricial bird species require more parental care, then is altriciality associated with greater parental effort? We suggest that such an association should arise from reciprocal selection on parental effort and early life traits. If so, then coevolution between developmental traits and parental effort could give rise to a continuum of parental effort that parallels the continuum from precocial to altricial offspring. Here, we explore the association between hatchling development and parental effort, with the expectation that species at the altricial end of the developmental spectrum should depend on care longer and should be more likely to exhibit biparental care than precocial species. We also explore the alternative hypothesis that changes in hatchling

development and parental effort are simply evolutionary consequences of selection of body size, fecundity, and survival.

14. Hickman, Caleb R., and Maureen B. Peters, Savannah River Ecology Laboratory. **Is there a colony-specific chemical cue to elicit an aggressive response in the red imported fire ant (*Solenopsis invicta*)? A field study** (animal behavior).

Understanding aggression in the red imported fire ant (*Solenopsis invicta*) is important in evaluating their invasive potential in the southeastern U.S. Aggression has been a focal aspect of fire ants' ability to compete with other species. Fire ants use chemical cues to detect an intruder whereby an aggressive response is displayed. Chemical cues are a form of communication where colony members can coordinate an attack. These attack cues could possibly vary between colonies that compete for resources. In this field study, we determine if attack chemical cues alone elicit an aggressive response. We also determine if colony specific attack cues evoke a more aggressive response. To test this we measure the degree of aggressive response between cues from different colonies. Furthermore, we outline future studies to determine the aggressive community dynamics of monogyne and polygyne colonies in comparison to native ant colonies where genetic assays will determine colony types.

15. Hill, E. Pierson, and Joseph Travis, Florida State University. **Introgressive hybridization and habitat disturbance in the *Nerodia fasciata*-*Nerodia clarkii* watersnake complex in north Florida** (evolution).

The study of hybrid zones can reveal processes important to the production and maintenance of species and hybrid introgression can be a threat to the conservation of locally adapted forms. Two species of closely related watersnakes (genus *Nerodia*) hybridize along the northern coast of Florida in human-modified habitats. By using a combination of morphological and molecular approaches, these hybrid populations will be compared with populations from intact habitats to elucidate patterns of natural selection, reproductive isolation, and gene flow.

16. Hunter, Rebecca L., and Kenneth M. Halanych, Auburn University. **Phylogeography of an Antarctic brooding brittle star** (molecular).

Studies examining population structure and genetic diversity of benthic (bottom-dwelling) marine invertebrates in the Southern Ocean have emerged recently. However, many groups remain unstudied, echinoderms being one example. The brittle star

Astrothoma agassizii is distributed widely throughout Antarctica and southern South America. This species is a brooding echinoderm without a planktonic larval stage, and therefore may have limited dispersal. In this study we wanted to evaluate hypothesized barriers to gene flow in the Southern Ocean, such as depth, geographic distance and the Polar Front, a region between Antarctica and South America marked by large temperature change and high flow velocity. Two mitochondrial genes were sequenced and compared from populations of *A. agassizii* from Antarctica and South America. Populations separated by the Polar Front were shown to be isolated and belonged to separate genetic lineages lacking morphological distinction. However, within lineages, genetic continuity was displayed across a large geographic range. Therefore, despite lacking a planktonic larval stage, *A. agassizii* can disperse across substantial geographic distance within continental shelf regions. These results indicate that geographic distance alone may not be a barrier to dispersal, but rather the combined effects of distance, depth and the Polar Front act to prevent gene flow between *A. agassizii* populations in Antarctica and South America. Similar levels of genetic diversity and divergence likely exist within other Southern Ocean invertebrates. Additional work is needed to further document biodiversity in this isolated biogeographic region in order to more fully understand the dynamic physical processes and extreme environmental conditions driving this diversity.

17. Janosik, Alexis M., Andrew R. Mahon, and Kenneth M. Halanych, Auburn University. **A molecular phylogeography of two Antarctic species in the genus *Odontaster* (Odontasteridae; Asteroidea) separated by the Drake Passage** (molecular).

The sea star *Odontaster validus* is one of the most abundant species in the Antarctic. With a circumpolar distribution, including the Sub-Antarctic, *O. validus* has been referred to as a keystone species of the Antarctic. Another member of this genera found in South American waters, *O. penicillatus*, exhibits morphological similarity. Its planktotrophic mode of development provides a great potential for dispersal although the Antarctic Circumpolar Current (ACC) may be acting as a biogeographical barrier. Population structure, genetic connectivity, and distribution of these species have never been rigorously examined by using molecular tools. These relationships were examined with a combined mitochondrial 16S ribosomal and cytochrome COI dataset from specimens collected throughout the Southern Ocean. The results show a separation

between the populations of *Odontaster* spanning the Drake Passage, preventing gene flow from occurring, despite a planktonic larval stage.

18. Jiang, Ke, Curtis Hansen, Leslie Goertzen, Auburn University. **Geographic distribution, diversity and flowering time of North America wild grapevines** (evolution).

The distribution and diversity of wild grapevine (genus *Vitis*) in North America are investigated using online herbaria database. The hypothesis that wild *Vitis* species are reproductively isolated by different flowering times is tested by analyzing location and time of flowering specimen collections. All species showed slight delay of flowering with the increase of latitude. Significant difference of flowering time was observed among some species. Major genes in pathways controlling flowering time will be characterized in *Vitis*. The variation and molecular evolution of these candidate genes will be studied.

19. Johnston, Cora A., and Romuald N. Lipcius, Hampshire College. **Macroalgae as alternative primary nursery habitat for juvenile blue crab in Chesapeake Bay** (conservation).

As eelgrass beds—the optimal primary nursery habitat for juvenile blue crab (*Callinectes sapidus*)—perish, restoration efforts must consider alternative habitats such as macroalgae like *Gracilaria* spp. Within the theoretical framework of the predation risk and growth rate (μ/g) trade-off hypothesis, survival of three size classes (<15 mm, 15–25 mm, and 25–50 mm carapace width) of juvenile blue crabs was examined in field experiments within seagrass, mud, and *Gracilaria* patches. As expected from the nursery habitat paradigm, survival was high for small and large juveniles in seagrass, and lowest for all juveniles in mud. In *Gracilaria* patches, survival of all juvenile size classes was high, often higher than in seagrass. This suggests that the complex structural refuge provided by *Gracilaria* spp. may be an effective substitute primary nursery for juvenile blue crabs until they reach a relative size refuge from predation at ~30 mm carapace width. Restoration efforts should consider macroalgae like *Gracilaria* spp. as a viable alternative nursery for the vanishing eelgrass beds in Chesapeake Bay.

20. Joyner, Jessica, and Janie Wulff, Florida State University. **Sponge community dynamics—summary of Belize reef and seagrass census** (ecology).

Within communities, organism abundance changes and following key organisms can provide

greater insight into community dynamics. One way to effectively collect data about an organism or community is to conduct repeated censuses.

Standard techniques, which note the species or the number of individuals present, fail to accurately represent the community because they do not account for species biomass. Including measurements of biomass during repeated censuses can allow for better comparisons of species, habitat, and role within the community. Reef and seagrass sponges, which perform a number of important functional roles in their communities (*e.g.*, water filtration, shelter, stabilizing coral), are compared using census data collected from Belize in June 2006 and 2007. Locations and volumes of each individual were recorded during the first census and the recensus noted presence or absence of sponges, remeasured individuals, plotted and measured new (recruited) sponges. Species accumulation curves suggest each community was sufficiently surveyed. The reef habitat had greater species diversity than the seagrass. Changes for each species, biomass and number of individuals, were not always directly related. Five species lost individuals but increased in total volume and one species found in both communities had different patterns of change. Coral reef species increased in volume and individuals while seagrass species generally decreased in volume and individuals. Additional data is necessary to predict if these short-term changes allow long-term predictions for both communities (*i.e.*, stability). Piecing together each aspect on a year-to-year basis will assist with local conservation and management of natural communities.

21. King, Joshua R., Florida State University. **Size-abundance relationships in Florida ant communities: sociometry reveals how social insects break the energetic equivalence rule** (ecology).

Social insects are among the most abundant terrestrial organisms, yet little is known of how social insect communities divide resources because it is difficult to measure the size and number of their colonies. The body size–abundance relationships of the ants of five upland ecosystems in Florida were studied. I tested whether abundance, energy use, and total biomass were distributed among species and body sizes as predicted by Damuth's energetic equivalence rule. Estimates of average worker body size, colony size, colony mass, and field metabolic rates were used to examine the logarithmic relationships among body sizes, population energy use and total biomass. These analyses revealed significant variation and did not support the energetic equivalence hypothesis. Specifically, population

energy use and total biomass were strongly skewed toward species with larger workers and colonies. Because body size was positively related to colony size and medium to large species were among the most abundant species in the fauna, it is clear that larger species with larger colonies account for a disproportionate fraction of the total abundance and mass of ants.

22. Lee, Jee Young, and Soojin Yi, Georgia Institute of Technology. **How reliable is sequence similarity as an inference for functional orthology? A case study using human and mouse genes** (evolution).

Orthologous relationships between genes in different genomes are often judged by sequence similarity, because functional evidence of orthology is lacking in most cases. However, this practice may lead to misidentification of orthologous relationships. We investigated human and mouse genomes to investigate whether genes identified to be orthologous based upon sequence similarity alone differ from genes that have some functional evidence supporting orthologous relationships. To answer this question, we first determined whether gene pairs (between human and mouse) with some functional evidence of orthology have experienced stronger functional constraint (as measured by dN/dS) than those with sequence similarity alone. Second, we tested whether gene pairs with functional support show stronger conservation in their gene coexpression network. We found that (i) regardless of the functional support, functional constraint increases with sequence similarity and (ii) gene coexpression patterns are not influenced by sequence similarity or the presence of functional support of orthology. Thus, at least for these two traits (functional constraint and coexpression patterns), sequence similarity is a good measure of functional orthology.

23. Lloyd, Dorothy H., Courtney A. Morgan, and David A. Beamer, East Carolina University. **The big picture on tiny salamanders: a phylogenetic survey of dwarf salamanders** (systematics).

The dwarf salamander (*Eurycea quadridigitata*), perhaps concomitant with its small stature, has consistently been overlooked by systematists. Due to the physical resemblance of one another, all populations of dwarf salamanders have traditionally been viewed as a single species. The recent description of a second species, *E. chamberlaini*, that was long confused with *E. quadridigitata* suggests a need to carefully examine populations rangewide. We have sampled over 50 populations of dwarf salamanders throughout their entire distribution (the coastal plain from North

Carolina into Texas). In order to reconstruct the evolutionary history of these salamanders we have amplified, purified, and sequenced 1100 base pairs of the mitochondrial gene *Cyt-b* and 1000 base pairs of the nuclear gene *RAG-1*. We have produced a phylogenetic reconstruction using Bayesian Inference, with separate partitions for each gene and codon position. Our results suggest that dwarf salamanders are more speciose than reflected by current taxonomy and as a result we propose to elevate several populations to specific status.

24. Mayon, Mindy, and Janice Bossart, Southeastern Louisiana University. **Insect assemblage of Winn Parish saline prairies** (ecology).

Saline prairies are rare and endangered habitats found scattered throughout northern Louisiana. They are nearly entirely unstudied, but are known to be home to six animal species of concern and one federally listed plant species. An insect assemblage will provide valuable insights into this unique and sensitive habitat and be a solid foundation for further research. For one year, pitfall and flight-intercept traps will be used to systematically collect insects in Winn Parish saline prairies and the adjacent forest habitats. The traps will be placed along transects that begin at the edge then extend to both the forest and the prairie habitats. Community diversity will be characterized with respect to species identities and their abundances. The data from both habitats will be statistically compared. Potential invasive species and species of concern will also be identified.

25. Mesko, J., and F. M. Harper, Rollins College. **DNA analysis of the seastars *Asterias rubens* and *A. forbesi* using nuclear markers** (evolution).

As a result of the last glacial maximum, the northwest Atlantic experienced wholesale extinction of many obligate rocky intertidal invertebrates. Following the retreat of the ice-sheets, the sibling species of seastars *Asterias rubens* and *A. forbesi* expanded out of refugia in Europe and the southern United States, respectively, and formed a secondary contact zone in the Gulf of Maine and along the coast of Nova Scotia. Despite having an initial divergence time of approximately 3.0 my, it is unclear whether sympatric (co-occurring) populations of *Asterias* spp. are reproductively isolated. Both species share the same microhabitat, have the same prey items and have overlapping spawning periods. Previous studies in our lab have demonstrated reciprocal gamete compatibility in controlled settings, and we have found evidence of limited natural hybridization through comparisons of morphology (phenotype) and mitochondrial DNA markers (genotype of maternal

lineage). In this study, I am expanding on this work by confirming the hybrid status of previously identified individuals using nuclear markers for two introns, ATPS β -7 and Ef-1 α -4. Using these bi-parentally inherited markers I will be able to further describe hybridization in individuals from sympatric populations. Results of the preliminary analyses of DNA sequences for previously identified hybrids as well as individuals from allopatric populations using intron ATPS β -7 will be presented.

26. Miller, Gabriel J., Lora L. Smith, Steve A. Johnson, and Dick Franz, University of Florida. **Home range, habitat use and refuge use of the Florida pine snake at Ichauway in southwest Georgia** (ecology).

Florida Pine snakes are believed to be declining and currently are considered a species of special concern in Florida. Habitat destruction is surmised to be a major source of the decline. In southwest Georgia, the Ichauway property is one of only a few islands of ecologically functional upland pine habitats with a viable population of Florida pine snakes. The purpose of this study is to understand the general requirements of pine snakes in the longleaf ecosystem including habitat use (at the landscape and micro-scale levels), refuge use and home range. A total of 12 Florida pine snakes (8 adult males, 3 adult females, and 1 sub-adult female) are being tracked for this study.

27. Olson, Grant L., and William A. Szelistowski, Eckerd College. **Adaptations of juvenile mangrove littorinids to predation by the pufferfish *Spherooides rosenblatti*** (ecology) The adults of two species of mangrove littorinids, *Littoraria varia* and *L. variegata*, use vertical migration and growth to a size refuge to avoid intense predation by the puffer fish *Spherooides rosenblatti* in the Gulf of Nicoya, Costa Rica. Juveniles of both species, however, are both unable to migrate above the jumping range of puffers, which can reach up to 13 cm above the water surface, and are too small to satisfy the size refuge obtained by adults. We hypothesized that juveniles of both species have mechanisms that reduce predation during this period of high vulnerability. Data from field surveys and predation trials revealed that juveniles exhibit several anti-predation adaptations: (1) Increasing vertical distribution above the water surface within the jumping range of puffers decreased puffer predation. (2) Juveniles concealed in root junctures, compared to those on outer root surfaces, faced lower rates of puffer predation. (3) Juveniles exhibited vertical migrational behaviors that minimized the time spent in the jumping range of puffers. (4) Juveniles grew at fast rates compared to

related species that minimized the time spent in the vulnerable size range. The results obtained in this study suggest that *S. rosenblatti* plays an important role in the ecology and life histories of juvenile *L. varia* and *L. variegata*.

28. Pfaller, Joseph B., Gregory M. Erickson, Paul Gignac, and Nathanael Herrera. **Ontogeny of bite-force generation in a durophagus turtle** (functional morphology).

The edentulous, akinetic feeding apparatus found in turtles provides a simple, yet relevant, system to conduct investigations of allometry and the ontogeny of feeding biomechanics and performance. While considerable attention has been given to the organization of skull elements and musculature in turtles, very little data has been obtained on the biomechanical performance of the jaws (e.g., bite force) and beak (e.g., strength, pressure generation). Feeding mode is a key factor determining morphological evolution and diversification of turtle skulls, whereby diet (especially durophagy) leads to parallel morphologies in different clades. Processing and consuming hard prey (durophagy) in turtles is relatively common, and this behavior is typically associated with an ontogenetic diet shift away from more soft-bodied prey. Because durophagy requires a feeding apparatus with sufficient biomechanical properties to produce and support high bite-forces, significant morphological changes across ontogeny would be expected. In this case, because bite-force generation is ecologically relevant, it is a good model for which to examine the relationship between allometry and the ontogeny of biomechanical performance.

29. Richard, Bonnie J., and Erin J. Watson, Southeastern Louisiana University. **The effects of *Chrysomya rufifacies* on the Louisiana insect carrion community** (ecology).

The role of necrophilous insects in ecology is to recycle decaying remains back into the outlying ecosystem. In forensic science, the studies of these necrophilous insects play an important role in determining postmortem intervals. It is important to have a record of necrophilous insects in each region, since each region has its own unique ecosystem. Because of this, if an invasive species is introduced, a record of its effects on the native carrion ecosystem should be well-documented. The last time the necrophilous insects of southeastern Louisiana were monitored was in 2004. Since that time, an aggressive invasive species of blow fly has been introduced. The purpose of this thesis is to record the effects of *Chrysomya rufifacies*, an invasive species, on native necrophilous dipteran and coleopteran

populations. *C. rufifacies* larvae are facultatively cannibalistic and feed on other calliphorid larvae, and also repel the native necrophilous insects from the carcass. The results will not only update the record of necrophilous insects in the Ponchartrain Basin, but also examine the effects of *C. rufifacies* and its apparent repelling capabilities on native species. It is also expected that the results will aid in future experiments to isolate the repellent(s) used by *C. rufifacies*.

30. Shah, Premal, University of Tennessee, Knoxville. **Are RNA thermometers unique?** (molecular).

Microorganisms are constantly faced with a changing environment. This has thus led to evolution of molecular sensors that permit them to regulate their gene expression in response to the changes in temperature, nutrient availability etc. One of the means by which microbes sense an increase in temperature is by thermodynamic "melting" (opening up of base-pairs) of regulatory regions of mRNAs called RNA thermometers. It has been previously hypothesized that there exists a small set of genes, which are translationally regulated by this mechanism. We used RNA folding simulations to identify potential RNA thermometers in the *E. coli* genome. Contrary to our expectations, we show that mRNAs have an inherent tendency to "melt" with an increase in temperature depending on the sequence. However, this property is not unique to the genes that are categorized as RNA thermometers, as a large fraction of genes undergo an increased melting of varying degree at high temperatures. We believe that the thermo-sensing property of mRNAs is a very widespread phenomenon.

31. Tso, Sarah, Florida State University. **Amphicarpy as a tool for studying dispersal** (evolution).

Why dispersal evolves has been a compelling question in the study of evolution and ecology but is inherently difficult to study both because it is difficult to describe the phenotype and to track the fate of the seeds that are dispersed. Amphicarpic plants can avoid these difficulties because they produce both underground and aerial seeds and the dispersal phenotype can be described as the proportion of the different seed types that are produced. The different seed types may be adapted to deal with the different selective factors associated with near and far dispersal. First, I will identify selective factors and the spatial scale over which those selective factors are important to the survival of a native species in its natural habitat. Second, I will provide evidence of both local adaptation and

environmental effects on the dispersal phenotype of that species. Third, I will present future questions I plan to address for my dissertation research.

32. Zakas, Christina, John Binford, Sergio Navarrete, and John Wares, University of Georgia. **Restricted gene flow among barnacle populations indicates possible selection or ecological shift** (evolution).

Larval recruitment in benthic coastal communities is strongly affected by oceanographic topography. Notably, current change and differences in upwelling regimes can cause a break in settlement patterns even in proximal regions. On the Chilean coast, barnacle settlement in the upper intertidal regions shows a marked decrease in recruitment above 32/33°S, possibly due to such oceanographic factors or differences in selective pressures. In order to better understand this observed community shift, genetic comparisons of the mitochondrial CO1 gene of *Notochthamalus scabrosus* have been synthesized for populations both north and south of the break. Phylogenetic analysis of the CO1 markers shows 3 distinct clades of one northern and two southern populations, demonstrating that this recruitment break is related to genotype. Further genetic comparisons in nuclear markers such as EF1 are currently being analyzed to better resolve parental source populations as well as specific selective pressures. With these results, more conclusive evidence can determine if this recruitment pattern is due to physical barriers or a sudden ecological shift.

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