

*8th Annual*



**ECOLOGICAL  
INTEGRATION  
SYMPOSIUM**

*From Speciation to Extinction:*

**INTERDISCIPLINARY APPROACHES TO BIODIVERSITY**



**FRIDAY 20 APRIL 2007  
EARL RUDDER THEATER**

**SATURDAY 21 APRIL 2007  
MEMORIAL STUDENT CENTER**

**TEXAS A&M UNIVERSITY**

# From Speciation to Extinction: Interdisciplinary Approaches to Biodiversity

Friday 20 April, Earl Rudder Theater

9:00 - 11:45 am	Morning Session
11:45 am - 1:15 pm	Lunch
1:15 - 5:00 pm	Afternoon Session
7:00 - 10:00 pm	Dinner and Reception

Saturday 21 April, MSC Rooms 201, 228, 229

Student Paper Presentations	9:00 am - 12:20 pm
Lunch in the MSC	12:20 - 1:30 pm
Student Poster Session	1:30 - 2:50 pm
Student Paper Presentations	3:00 - 4:30 pm
Keynote Address	4:30 pm

Welcome to this year's Ecological Integration Symposium at Texas A&M University. This nationally recognized symposium is in its 8th year of attracting renowned, cutting-edge scientists to address trends and frontiers in ecological research and conservation. The EIS series was originally developed by graduate students in the Department of Wildlife & Fisheries Sciences. Today, the symposium is an interdisciplinary event, run by a volunteer graduate student committee composed of students across the Texas A&M campus. Since the first symposium in 2000, the EIS has been a resounding success, attracting 500 attendees annually and hosting prominent scientists from diverse areas of ecology, evolution, and environmental science and policy. The title of this year's symposium is "From Speciation to Extinction: Interdisciplinary Approaches to Biodiversity." With this broad theme in mind, we have structured the symposium to encompass myriad aspects of the generation, maintenance, and loss of biodiversity. Implicit in this ambition, of course, is the desire for several integrated perspectives, including biological, social, political, and economic viewpoints. We sincerely thank you for attending the 2007 EIS and hope your time at the event is filled with intellectually invigorating discourse relevant to the pressing topics at hand!

Sincerely,

2007 EIS Student Planning Committee:

Juliet Brophy, Department of Anthropology  
Kim Paczolt, Department of Biology  
Robert Puckett, Department of Entomology  
Clay Small, Department of Biology  
Laura Weber, Department of Wildlife and Fisheries Sciences  
Bob Wyckoff, Department of English

<<http://wfsc.tamu.edu/eis/>>

## Acknowledgements and Thanks

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No event of this scale is possible without the fiscal and organizational support of multiple institutions. The EIS planning committee would like to take this opportunity to express our utmost gratitude to the many sponsors of this year's symposium.

We would especially like to thank the Texas A&M Program in Ecology and Evolutionary Biology (EEB) for their substantial and continued commitment to the success of the symposium. The EEB is a rapidly expanding interdisciplinary research unit, composed of talented faculty, post-docs, and students from across campus. For more information about the diverse and esteemed research conducted by this group of scientists, please visit <[eeb.tamu.edu](http://eeb.tamu.edu)>.

Special thanks to the Department of Wildlife and Fisheries Sciences are also in order for the much appreciated contribution of necessary administrative resources, both human and material.

Additionally, the committee members would like to express thanks to our respective departments for supporting and encouraging our efforts, as well as for their financial support:

- Department of Anthropology
- Department of Biology
- Department of English
- Department of Entomology
- Department of Wildlife and Fisheries Sciences

All of the following sponsors also contributed financially to the event. Again, their assistance makes EIS possible, and we deeply appreciate them for this:

- EEB
- Office of Graduate Studies
- College of Agriculture and Life Sciences
- College of Science
- Institute of Renewable Natural Resources
- Vice President for Research
- Department of Rangeland Ecology and Management
- College of Liberal Arts
- Office of the Provost
- Association of Graduate Wildlife and Fisheries Students
- University Writing Center

Finally, the committee would like to thank Lee and Gini Fitzgerald for once again graciously offering up their home for the reception.

## From Speciation to Extinction: Interdisciplinary Approaches to Biodiversity

Friday 20 April 2007  
Rudder Theater  
Texas A&M University  
College Station

- 9:00-9:30 Refreshments
- 9:30-9:40 Opening Remarks, Dr. Jim Woolley, Department of Entomology and Program in Ecology and Evolutionary Biology
- 9:40-10:40 **Rapid Evolution of Unprecedented Ecological Novelty in Hawaiian Insects and Its Implications for Conservation Biology**  
Dan Rubinoff, Assistant Professor of Entomology and Director of the University of Hawai'i Insect Museum
- 10:45-11:45 **Experiments on Biodiversity, Community Dynamics, and Ecosystem Functioning**  
Peter Morin, Professor II and Director of the Graduate Program in Ecology & Evolution at Rutgers University
- 11:45-1:15 Lunch. Please feel free to join the speakers. The location will be announced.
- 1:15-2:15 **Environmental Dynamics and the Origin of Human Adaptability**  
Dr. Rick Potts, Director of the Human Origins Program and Curator of Anthropology at the National Museum of Natural History
- 2:20-3:20 **Numbers and Nerves: Biodiversity, Meaning, and Language in a World of Data**  
Dr. Scott Slovic, Professor and Director of the Graduate Program in Literature and Environment, University of Nevada, Reno
- 3:20-3:40 Refreshments
- 3:40-5:00 Panel Discussion moderated by Dr. Doug Slack, Regents Professor, Wildlife and Fisheries Sciences. Please submit questions via notecards provided.
- 7:00-10:00 Reception and Dinner at the home of Dr. Lee Fitzgerald  
8901 Sandstone, College Station (see map on page 7)

Dan Rubinoff

Assistant Professor of Entomology and Director of the University of Hawai'i Insect Museum  
rubinoff@hawaii.edu

### **Rapid Evolution of Unprecedented Ecological Novelty in Hawaiian Insects and Its Implications for Conservation Biology**

The Hawaiian Archipelago is one of Earth's most isolated landmasses, and a rich substrate for the study of evolution. Due to human impacts it is also a classic example of the challenges facing conservation biology. Endemic Hawaiian insects are excellent examples of this remarkable diversity. Specifically, I will focus on snail-eating and SCUBA-diving caterpillars as well as ice-walking predatory bugs restricted to the summits of dormant 3,800 meter volcanoes. By combining evolutionary and ecological data to examine patterns of speciation and ecological diversification this research permits a synthetic consideration of molecular and life history datasets. Results suggest rapid and globally novel evolutionary pathways have arisen in different groups of Hawaiian insects. Patterns of speciation and ecology revealed by this research are not only theoretically significant but also essential precursors to effective conservation. Results of theoretical research will be presented and discussed in the applied context of conservation biology.

Dr. Rubinoff's research centers on the application of systematics, using both DNA and morphological characters, to understand the evolution, ecology and improve the conservation of native insects. Additionally, he is interested in the role phylogenetics can play in reducing the invasive species problem that plagues endemic ecosystems on a global scale.

"I find the most rewarding part of my research is the times of discovery; this can happen in the field when we come across a new fantastic beast or novel behavior, or in the lab when an analysis suggests an unanticipated relationship between species. Both instances give us just another thrilling peek into the spectacular machinations of evolution. Similarly, the excitement and importance of such discoveries must be translated into some kind of conservation currency so that the inherent value of even the inconspicuous species can be appreciated and such lineages saved."

Peter Morin

Professor II and Director of the Graduate Program in Ecology & Evolution at Rutgers University  
pjmorin@rci.rutgers.edu

### **Experiments on Biodiversity, Community Dynamics, and Ecosystem Functioning**

I plan to describe results of several studies from our laboratory that explore links between biodiversity, ecosystem functioning, and the dynamics of populations and communities. First, I describe some of our early work on biodiversity and functioning in microbial systems, and show how these patterns hold up when reanalyzed to address various critiques (McGrady-Steed et al. 1997, *Nature*; McGrady-Steed & Morin 2000, *Ecology*; Morin & McGrady-Steed 2004, *Oikos*). Second, I show how more recent studies of microbial systems allow us to explore the stability and resilience of systems of differing diversity subjected to explicit experimental perturbations (Petchey et al. 1999 *Nature*; Steiner et al. 2005, *Ecology Letters*, Steiner et al. 2006, *Ecology*). Third, I describe how experimental manipulations of productivity can be used to explore possible causes of scale-dependent patterns of diversity and invasibility (Jiang & Morin, 2004, *Ecology Letters*). Throughout my talk, I will describe where these findings either support or refute existing theory and the ongoing debate about links between biodiversity and the properties of complex systems, and I will suggest where important new directions for research in biodiversity and functional ecology exist.

Peter Morin has been intrigued by the ecology of aquatic systems ever since he received his first microscope at the age of 5. Much of his recent research has focused on relationships between biodiversity and ecosystem functioning in natural and model communities. His laboratory uses microbes to test basic ideas about the role of different species in driving community and ecosystem processes. These studies include explorations of links between diversity and ecosystem predictability, and studies of effects of biodiversity on responses of ecosystems to gradual environmental change. Other research has explored the consequences of food web structure for population dynamics, relations between productivity and food chain length, and effects of different top predators on food web composition. Additional topics of particular interest include the interactive effects of competition, predation, and the history of community assembly on patterns of species abundance in organisms including protists, insects, and amphibians. His textbook, *Community Ecology*, summarizes views about the many interacting factors that structure communities.

Morin has served on the editorial boards of several journals, including *Ecology*, *Ecological Monographs*, *Ecology Letters*, and *The American Naturalist*. He received the Mercer Award in 1985 from the Ecological Society of America, and he was elected as a Fellow of the American Association for the Advancement of Science in 1999. He has published numerous papers in a variety of leading journals, including *Nature* and *Science*.

Rick Potts

Director of the Human Origins Program and Curator of Anthropology at the Smithsonian Institution  
National Museum of Natural History  
hop@nmnh.si.edu

### **Environmental Dynamics and the Origin of Human Adaptability**

A renowned specialist in human origins research, Dr. Potts joined the Smithsonian in 1985. He has spent much of his career piecing together a record of Earth's environmental change and human adaptation to those shifts. His ideas about how human evolution was a response to environmental uncertainty and disruption have stimulated wide attention and new research in several scientific fields. During Dr. Potts's tenure at the Smithsonian, he has developed a program of international collaboration among scientists interested in the ecological aspects of human evolution. He leads excavations at early human sites in the East African Rift Valley, including the famous handaxe site of Olorgesailie, Kenya, and Kanam near Lake Victoria, Kenya. He also co-directs ongoing projects in southern and northern China that compare evidence of early human behavior and environments from eastern Africa to eastern Asia.

The author of numerous research articles and books, such as *Early Hominid Activities at Olduvai* (Aldine de Gruyter, 1988) and *Humanity's Descent: The Consequences of Ecological Instability* (William Morrow, 1996), Dr. Potts has also been interviewed numerous times on PBS's *NewsHour with Jim Lehrer*, and NBC's *Today Show*, as well as National Public Radio's *All Things Considered*, *Morning Edition*, and *Talk of the Nation*. He has received a number of honors, including a Certificate of Honor from the Academy of Television Arts and Sciences for the Emmy-winning *Tales of the Human Dawn* on PBS (1990), election as a Fellow of the American Association for the Advancement of Science (2004), and the Explorer's Club Lowell Thomas Award (2005).

Scott Slovic  
Professor and Director of the Graduate Program in Literature and the Environment, University of  
Nevada, Reno  
slovic@unr.edu

### **Numbers and Nerves: Biodiversity, Meaning, and Language in a World of Data**

As historian Alfred A. Crosby has discussed in *The Measure of Reality: Quantification and Western Society, 1250-1600* (1997), quantification emerged in thirteenth-century Europe as a powerful—perhaps even as the dominant—gauge of truth (“measure of reality”). In virtually all aspects of contemporary life in industrialized countries—from economics to medicine to cooking—the use of numbers seems necessary and inevitable, part and parcel of healthy, rational thought and action, the essence of meaning. And yet, despite the usefulness of numbers, there persists an uneasiness with the notion of numbers as a medium of communication and as a gauge of reality. At the same time, the questioning of how numbers achieve—or fail to achieve—meaning or salience in the minds of individuals or the broader public has become an important research topic in contemporary social science, particularly in the field of cognitive psychology. In this paper, I will use such psychological concepts as “the affect heuristic” and “psychic numbing” to illuminate communication strategies used by many contemporary environmental writers, paying particular attention to examples from David Quammen’s 1996 book *The Song of the Dodo: Island Biogeography in an Age of Extinctions*. I will also report on some of the results from recent interviews I’ve conducted on this subject with Indian scientist, activist, and author Vandana Shiva, Mexican activists and authors Homero and Betty Aridjis, and American biologist and essayist Sandra Steingraber.

Scott Slovic grew up in Eugene, Oregon. He became particularly sensitive to the importance of place and environment in human experience—and the literary expression of such experience—when he went away to New England for graduate school at Brown and found himself living “in exile” from the American West. Scott has now been studying environmental literature and helping to demonstrate and theorize the field of “ecocriticism” (ecological literary criticism) for more than twenty years. He has published more than 100 articles on American, Australian, German, and Japanese environmental literature and has written or edited fourteen books, with four more due to be published in the near future, including *Life/Savor: Engagement, Retreat*, and *Ecocritical Responsibility and Yucca Mountain* (the latter will appear in the University of Arizona Press’s Desert Places Series).

From 1992 to 1995, Scott served as the founding president of the Association for the Study of Literature and Environment (ASLE), and since 1995 he has edited the leading journal in this field, *ISLE: Interdisciplinary Studies in Literature and Environment*. He has also been a Fulbright Scholar at the University of Bonn (Germany), the University of Tokyo (Japan), and the Guangdong University of Foreign Studies (China) and a visiting researcher at Rice University, the University of Queensland (Australia), and National Taiwan Normal University.



# EIS Reception and Dinner

Friday 20 April 2007

7:00-10:00 pm

Direction to Lee and Gini Fitzgerald's home at 8901 Sandstone, College Station

Please park on the street and be careful not to drive onto anyone's yard

From the Symposium

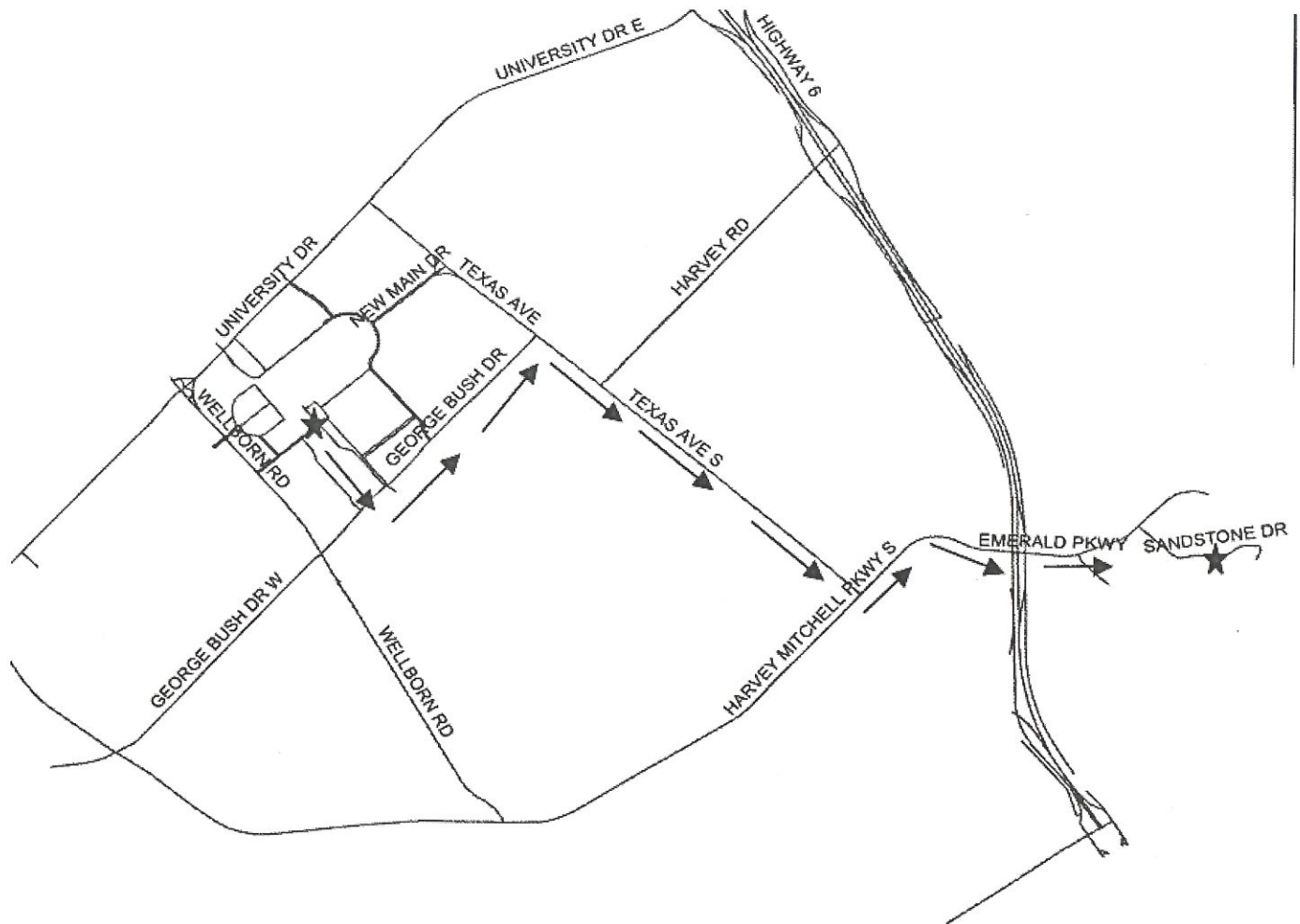
Head East on George Bush Drive

Head South (turn right) on Texas Avenue to Harvey Mitchell / FM 2818

Head East (turn left) on Harvey Mitchell

Harvey Mitchell turns into Emerald Parkway

Turn right on Sandstone



Eighth Annual Ecological Integration Symposium

# From Speciation to Extinction: Interdisciplinary Approaches to Biodiversity

21 April 2007

Memorial Student Center Rooms 201, 226, 228  
Texas A&M University  
College Station

- 9:00-9:30 am      Coffee and Refreshments MSC 201
- 9:30-12:20 pm    Student Paper Session I    MSC 228 and 229
- 12:20-1:30 pm    Lunch MSC 201
- 1:30-2:50 pm     Student Poster Session MSC 201
- 3:00-4:00 pm     Student Paper Session II: Biodiversity MSC 228 and 229
- 4:00 pm            Keynote Address by Dr. Thomas E. Lacher, Jr., Professor of  
Wildlife Ecology and Department Head, Wildlife and Fisheries  
Sciences    MSC 201
- Awards Presentation

See pages 12-24 for abstracts

## Student Paper Session I (9:30 to 12:20)

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### Room 228

- 9:30 Julia Belknap "Seeing Corals in My Kitchen Sink": Scuba Divers' Experiences and Responses to a Conservation Education Program
- 9:50 Adrian Dahood Trends in Dusky Dolphin (*Lagenorhynchus obscurus*) Occurrence Patterns Near Kaikoura, New Zealand: Observations from Tour Boats, 1995-2006
- 10:10 Katrina Menard Population Genetic Structure of *Conophthorus ponderosae* Hopkins (Coleoptera: Scolytidae) Inferred from Mitochondrial DNA Haplotypes
- 10:30 Carrie Miller Factors Influencing Algal Biomass in Hydrologically Dynamic Ponds in a Subtropical Salt Marsh Landscape

#### BREAK

- 11:00 Michelle Sanford Do Female Mosquitoes Make Oviposition Decisions Based on Larval Experience With Predators?
- 11:20 Nicole Smolensky Estimating Population Densities of the Endemic Sand Dune Lizard (*Sceloporus arenicolus*)
- 11:40 Amanda Subalusky The Use of Hydrogen Stable Isotopes in Studying the Hydrology of Aquatic Ecosystems
- 12:00 Amanda Young The Climatic and Herbivory Response in the Tree-Rings of Mountain Birch (*Betula pubescens* spp. *czerepanovii*) in Northern Sweden

### Room 229

- 9:30 Cody Zilverberg Population Growth and Fertilizer Use: Ecological and Economic Consequences in Santa Cruz del Quiché, Guatemala
- 9:50 Michael Meek Distribution of White-Tailed Deer Relative to Prescribed Burns on Rangeland in South Texas
- 10:10 Lavell Merritt Sun, Sea, and Sand: Piping Plover and People: A Case Study Evaluating Public Involvement
- 10:30 Thomas Miller Development of a Thyroid Stimulating Hormone Challenge Test to Evaluate Thyroid Disruption in Red Drum

#### BREAK

- 11:00 Chad Smith Independent Effects of Male and Female Density on Male Competition for Mates in the Western Mosquitofish
- 11:20 Jason Sumners Does Male White-Tailed Deer (*Odocoileus virginianus*) Social Dominance Fail During the Peak of the Rut?
- 11:40 Robin Vaughn Dusky Dolphins Influence Feeding Efficiency of Seabirds, Fur Seals, and Sharks
- 12:00 David Lundquist Behavior and Movement of Southern Right Whales: Effects of Boats and Swimmers

## Poster Presentation Session (1:30 to 2:50 PM)

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### Room 201

- Gary Burr                      Evaluation of Performance and Whole-Body Composition of Hybrid Striped Bass and Red Drum Fed High-Protein and High-Lipid Diets
- Lauren Butaric                A Preliminary Study on the Relationship Between Nasal Cavity and Maxillary Sinus Volumes of Homo sapiens
- Chris Crews                    Village Lithics: Implications for Samoan Archaeology
- Ricci Grossman                Dental Enamel Hypoplasia and Middle Pleistocene Homo
- S. Ben Harnden\*              Small-Scale Patterns of Plant Species Richness: Implications for Biodiversity and Exotic Invasion
- Jonathan King\*                Beetle Diversity and Richness Comparisons Between Juniperus Managed and Juniperus Unmanaged Upland Evergreen Sites in the Texas Hill Country Area
- Chih-Lin Wei\*                 GIS Modeling of Large Benthic Invertebrate in Respect to the Deep Currents off the Coast of North Carolina
- Marc Andres\*\*                 Influence of Fish on Ecosystem Properties in an Urban Wetland, Laredo, TX

\* Biodiversity Poster

\*\* Undergraduate Researcher

## Student Paper Session II: Biodiversity (3:00 to 4:00 PM)

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### Room 228

- 3:00 Karen Alofs Consequences of Habitat Fragmentation for Biodiversity and Invasive Species
- 3:15 Aaron Dickey Host Associated Differentiation in Indigenous Tree Species
- 3:30 Samraat Pawar The Effects of Environmental Fluctuations on Population Interaction Webs: Diversity Begets Stability, or Vice Versa?
- 3:45 Aubrey Colvin Rank Has Its Privileges: A Taxonomic Revision of *Metopius* (Hymenoptera: Ichneumonidae)

### Room 229

- 3:00 Mika Cameron A Morphological Evaluation of the Sub-Apical Dorsal Notch of the Ovipositor in Ichneumonidae (Hymenoptera)
- 3:20 Andrea Joyce Acoustic Courtship Songs of Species and Strains of the *C. flavipes* Complex in Kenya
- 3:40 Fernanda Pegas Sea Turtle Conservation, Tourism, and Urban Development in the Area of Environmental Protection of the Northern Coast, Bahia, Brazil

## Keynote Address and Awards Presentation (4:00 pm)

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### Room 206

Dr. Thomas E. Lacher, Jr.

**Consequences of Habitat Fragmentation for Biodiversity and Invasive Species**

Habitat fragmentation, the breaking apart of habitat, usually occurs with habitat loss. Because the relationship between these two processes is often ignored, the effects of fragmentation per se on biodiversity are poorly understood. I will evaluate the direct and indirect effects of fragmentation on native species diversity and on the spread of an invasive plant, *Bothriochloa ischaemum*, on the eastern Edwards Plateau. In this region woody plant encroachment has created landscapes that vary in both the amount and distribution of herbaceous habitat, which will allow us to separate the effects of habitat loss from the effects of fragmentation per se. Models suggest that fragmentation can limit the spread of invasive plants with limited long distance dispersal; this study will empirically test this hypothesis. Ecologists are currently debating the sign of the relationship between diversity and invasibility, with evidence on both sides. My work will include (1) observational studies to measure the relationship between fragmentation per se, native biodiversity, and the presence of *B. ischaemum*, (2) experiments and associated modeling to examine the effects of fragmentation on the spread of *B. ischaemum*, as a function of the species' limited dispersal, (3) experiments to measure the effects of species richness on the establishment of *B. ischaemum*. I predict that fragmentation of herbaceous patches by woody plants (a) reduces within-patch native species richness, and (b) slows the spread of the dispersal-limited exotic grass, but (c) indirectly facilitates its establishment by reducing native species diversity.

**Marc Andres, Texas A&M International University**

**Monica Trevino, Texas A&M International University**

**Sushma Krishnamurthy, Texas A&M International University**

**Thomas Vaughan, Texas A&M International University**

**Fran Gelwick, Department of Wildlife and Fisheries Science, Texas A&M University**

**Influence of Fish on Ecosystem Properties in an Urban Wetland, Laredo, TX**

By identifying the underlying interactions among various ecosystem components, scientists will better understand the mechanisms that produce important ecological services, and be able to better estimate the influence of environmental changes and feasibility of intended management outcomes. From June to December 2006, we studied the influence of fish on Net Primary Productivity (NPPR) and Chlorophyll a on sampling substrata in an urban wetland of Chacon Creek, Laredo TX. Three pairs (open and closed to large fish) of mesh pens were constructed. Clay sampling tiles were placed inside and outside each experimental pen and each treatment also contained a trio of nutrient diffusing cylinders of agar enriched with N ( $\text{NaNO}_3$ ) or P ( $\text{K}_2\text{HPO}_4$ ), or non-enriched (control). We measured net primary productivity as oxygen evolution ( $\text{mgL}^{-1}\text{min}^{-1}$ ), and benthic organic matter as Ash Free Dry Mass ( $\text{mg/cm}^2$  AFDM) on tiles, and chlorophyll a and pheophytin ( $\mu\text{g/ml}$ ) on cylinders. Chlorophyll a was lower in closed pens than in open or no-pen controls, especially for no-nutrient, control cylinders (adjusted  $R^2=0.41$ ,  $p=0.008$ ). Abundant, small, grazing and omnivorous fishes reduced algal biomass when larger omnivorous and piscivorous fishes were excluded, and nutrient addition (especially P) can reduce the effects of small fishes. NPPR/area was highest in November, especially in open pen and no-pen control samples (adjusted  $R^2=0.11$ ,  $p=0.05$ ), suggesting that activities of smaller fishes promoted stable levels of benthic productivity. Our research was sponsored by the NSF Undergraduate Mentoring in Environmental Biology Program, and collaboration by faculty and students at Texas A&M University and Texas A&M International University.

**Julia Belknap, Department of Recreation, Park, and Tourism Sciences, Texas A&M University**

“Seeing Corals in My Kitchen Sink”: Scuba Divers’ Experiences and Responses to a Conservation Education Program

The direct impacts scuba divers have on coral reefs are becoming a concern. While there are several management techniques that managers can use to minimize impacts, education is a popular technique used to manage scuba divers. The premise for using education is that it is capable of influencing scuba diver behavior thus reducing divers’ impacts on coral reefs. However, little is known about the actual efficacy of conservation education programs for scuba divers. This research study employed two teaching approaches, one based on the results of recent neuro-cognitive research and the other the dominant teaching approach, to contrast and compare divers’ responses. I asked under what conditions divers: 1) learn best about coral reefs, 2) are most amenable to changing their attitudes and behavior, and 3) are most amenable to participating in a program. Pre- and post-questionnaires as well as ethnographic methods such as participant observation, a time allocation tool, and semi structured interviews were employed to gather the data. The structure of the quasi experiment did not hold up in the field. Consequently, the quantitative data does not show any significant differences between the two teaching approaches. The qualitative data provides a clear picture of what occurred in the field and thus can help explain the data’s results as well as help to answer the research questions. This research will help to improve conservation education programs for scuba divers around the world.

**Gary S. Burr, Department of Wildlife and Fisheries Sciences, Texas A&M University**

**Peng Li, Department of Wildlife and Fisheries Sciences, Texas A&M University**

**Jonathan B. Goff, Department of Wildlife and Fisheries Sciences, Texas A&M University**

**Barbara Grisdale-Helland, Institute of Aquaculture Research (AKVAFORSK), N-6600 Sunndalsøra, Norway**

**Ståle Helland, Institute of Aquaculture Research (AKVAFORSK), N-6600 Sunndalsøra, Norway**

**Delbert. M. Gatlin III, Department of Wildlife and Fisheries Sciences, Texas A&M University**

Evaluation of Performance and Whole-Body Composition of Hybrid Striped Bass and Red Drum Fed High-Protein and High-Lipid Diets

Expensive labor and utility infrastructure costs are the primary constraints to expansion of the aquaculture industry in developed countries such as the United States of America. Dietary fortification of protein and energy is a potentially promising way to enhance growth and protein accretion and compensate for labor and other expenses by shortening production cycles. To investigate the potential use of increasing nutritional density of diets for rapid growth of warmwater fishes, a feeding trial was conducted in which growth performance, body indices and whole-body composition of juvenile hybrid striped bass fed diets comprised of protein (49% - 59%), lipid (16 - 28%) and energy (22.0 - 25.1 kJ/g) concentrations beyond established minimum levels were compared to fish fed a more typical commercial reference diet. A subset of the experimental diets and the commercial reference diet also were fed to juvenile red drum. Hybrid striped bass fed the high-protein and high-lipid diets showed much greater growth performance. Hepatosomatic index (HSI), intraperitoneal fat (IPF) ratio and whole-body protein were significantly ( $P < 0.01$ ) influenced by dietary protein level. The dietary lipid and associated energy level had significant ( $P < 0.05$ ), negative linear effects on daily feed intake. HSI, IPF ratio and whole-body protein of hybrid striped bass and red drum. Red drum grew very similar to hybrid striped bass in response to the experimental diets. In particular, the excessive lipid in the diet increased HSI and whole-body lipid of red drum, but not hybrid striped bass.

**Lauren N Butaric, Department of Anthropology, Texas A&M University**  
**Douglas Broadfield, Department of Anthropology, Florida Atlantic University, Boca Raton, FL**  
**Robert McCarthy, Department of Anthropology, Florida Atlantic University, Boca Raton, FL**

**A Preliminary Study on the Relationship Between Nasal Cavity and Maxillary Sinus Volumes of Homo Sapiens**

Previous research suggests that nasal cavity volume (NCV), thought to be related to climate, is inversely correlated with maxillary sinus volume (MSV). According to this hypothesis, changes in nasal cavity size and shape reflect physiological needs, such as warming and humidifying inspired air. Owing to volumetric constraints in the mid-face, relative increases in NCV are hypothesized to result in concomitant decreases in MSV, respectively. To test this hypothesis thirty-nine dried adult human crania from seven different climatic regions were examined using computerized tomography (CT) scans. Significant differences in MSV and NCV between populations were identified using Analysis of Variance (ANOVA). In addition, least-squares and reduced major axis (RMA) regression analyses were performed to test the scaling relationships between MSV, NCV and several cranial size variables. Contrary to previous studies, results indicate that MSV and NCV are not significantly correlated. RMA analyses indicate that NCV, but not MSV, scales isometrically with skull size. Finally, post hoc ANOVA results identify significant differences between human populations for MSV that do not follow climatic or environmental trends. These results suggest that (1) it is unlikely that NCV and MSV compete for space in the mid-face, (2) NCV is largely a byproduct of skull size, and (3) NCV and MSV may not be as closely tied to climate as previously thought. Additional genetic and epigenetic factors need to be considered regarding the structure and function of the human maxillary sinus.

**Christopher Crews, Department of Anthropology, Texas A&M University**

**Village Lithics: Implications for Samoan Archaeology**

**Abstract**

The stone tools recovered during the excavation of the small village of Aganoa, American Samoa possibly span the whole extent of human settlement in the Samoan Archipelago. The differences in time placement and morphology of these stone tools often are what is expected to be found in Samoa. But, there are some artifacts that do not fit into any current typology. There is also a lack of a certain tool type (scrapers) in the earliest cultural layer possibly indicating reliance on reef and other sea foods instead of agricultural foods. Along with these important point stone tool technologies such as blades and cores were found yet they are not dealt with in the literature of Samoan archaeology.

**Mika D. Cameron, Department of Entomology, Texas A&M University**

**A Morphological Evaluation of the Sub-Apical Dorsal Notch of the Ovipositor in Ichneumonidae (Hymenoptera)**

Ichneumonidae is the most speciose family within Hymenoptera. The incredible diversity of ichneumonids is reflected in the many different lifestyles and associated morphological characters. The Ophioniformes is a grouping of ichneumonid subfamilies which possess a sub-apical dorsal notch located on the ovipositor. The validity of this character is questionable due to inconsistencies within Ophioniformes. This putative synapomorphy, presence of a sub-apical dorsal notch, is not present in all the subfamilies that comprise Ophioniformes but is present in at least a few ichneumonids that are not currently classified as Ophioniformes. Survey results that examine that extent of this problem will be presented.



**Aubrey M. Colvin, Department of Entomology, Texas A&M University**

Rank Has Its Privileges: A Taxonomic Revision of *Metopius* (Hymenoptera: Ichneumonidae)

Clarity of definition is the goal of many taxonomic revisions; there have been significant shuffling of both taxonomic names and their rank within the Linnaean classification with the intent of improving the classification of some particular group. The family Ichneumonidae is one of the largest within the Vertebrata, and due to its substantial size has gone through many changes in classification. Recent examination of the Costa Rican ichneumonid fauna brought into question the validity of the use of subgenera within the genus *Metopius*. A morphological analysis of the subgenera will be done to assess if these subgenera, as currently defined, represent stable monophyletic groupings.

**Adrian Dahood, Marine Biology Department, Texas A&M University Galveston**

**Bernd Würsig, Marine Biology Department, Texas A&M University Galveston**

**Ian Bradshaw, Encounter Kaikoura, Kaikoura, New Zealand**

**Dennis Buurman, Encounter Kaikoura, Kaikoura, New Zealand**

**Lynnette Buurman, Encounter Kaikoura, Kaikoura, New Zealand**

Trends in Dusky Dolphin (*Lagenorhynchus Obscurus*) Occurrence Patterns Near Kaikoura, New Zealand: Observations from Tour Boats 1995-2006

In Kaikoura, New Zealand, dusky dolphins (*Lagenorhynchus obscurus*), also termed "duskies", support a thriving tourism industry. Encounter Kaikoura, a major dolphin tour operator in Kaikoura, has been collecting data on dusky group numbers and GPS coordinates since October 1995. The data set describes the first group of dolphins encountered each day. Therefore, it is a measure of closeness to the commercial on-shore boat harbor, not a fair indication of location of all dolphin groups in the Kaikoura area. Despite much variance within and between seasons and years, there is a generally recurring seasonal pattern. In summer, duskies are found in near-shore waters, frequently clustered around the Kaikoura Canyon head. In winter, dolphins are found farther offshore, often associated with the deeper waters of the Kaikoura Canyon axis, and widely scattered throughout the study area. This onshore/offshore pattern is stable across the 12 years of data. Duskies' affinity for the Kaikoura Canyon may reflect a strategy to maximize access to prey; duskies in Kaikoura feed at night on the Deep Scattering Layer as it rises to the surface. The duskies' distribution along shore, particularly during summer months, changes during the study period. There is a greater incidence of duskies in the southernmost region of the study area during the late 1990's than in later years. We are presently investigating the role of predators such as sharks and killer whales; prey availability especially relative to night-time feeding; human presence; and other abiotic factors in potentially influencing dusky habitat use patterns.

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Host Associated Differentiation in Indigenous Tree Species

Host Associated Differentiation (HAD) is the formation of genetically distinct host associated populations favored by ecological isolation and natural selection. One of the genotypic signatures of HAD is that populations on the same type of host do not exhibit differentiation across space (isolation by distance) but do exhibit differentiation when found on different host types in sympatry. HAD, as a mechanism promoting sympatric speciation, has been invoked to explain the enormous diversity of phytophagous insects. HAD may influence biodiversity assessments because organisms within the same species may belong to genetically distinct, host-specialized populations. I will explain why hickories of the genus *Carya* and their associated insect fauna provide a good model system for testing the prevalence of HAD in both phytophagous insects and parasitoids.

**Dental Enamel Hypoplasia and Middle Pleistocene Homo**

The presence of enamel hypoplasia in two temporally and geographically discrete European Middle Pleistocene Homo populations from Atapuerca, Spain and Krapina, Croatia are discussed. The Sima de los Huesos site, located in the Sierra de Atapuerca in North-Central Spain, has yielded hominid remains dating to approximately 350,000 years ago. The Krapina site, located in northern Croatia, has yielded hominid remains dating between 120,000 and 140,000 years ago. The rates of dental enamel hypoplasia at these two sites are compared to data from two studies summarizing finds from a broad sample of European Neanderthals. Using Kolmogorov-Smirnov tests, the populations represented at the Atapuerca and Krapina were found to exhibit significant differences from each other in the number of individuals affected. Additionally, although the rate of hypoplasia (by individual) was not significantly different from the "average" Neanderthal sample population, that of the Atapuerca hominids was significant at the 95% confidence interval. Interpretations of the data from these sites are considered with reference to the osteological paradox presented by Wood et al. (1992). Suggestions for future research are also discussed.

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**Small-Scale Patterns of Plant Species Richness: Implications for Biodiversity and Exotic Invasion**

Understanding the factors that influence patterns of species richness has been a major goal of ecology for half a century. More recently, some researchers have begun to ask the question whether the number of species in a particular area (richness) can in turn influence community properties such as invasibility. We studied small-scale patterns of plant species richness, soil moisture and topography on an "open field" along the Blanco River in San Marcos, TX. Plant species richness was positively correlated with both between-plot mean soil moisture and within-plot soil moisture heterogeneity. We also found that the number of exotic species in plots was positively correlated with the overall species richness of the plot. When put in the context of local climatic conditions the positive linear relationship between soil moisture and plant species richness can be explained as representing the ascending portion of the unimodal diversity curve with highest richness at intermediate productivity. Our finding of a positive relationship between species richness and within-plot soil moisture heterogeneity supports the idea that coexistence of directly interacting species can be enhanced by small-scale resource variability. The relationship we found between overall species richness and exotic species richness at our site provides further evidence that the environmental factors that increase overall species richness may have the same effect on exotic as on native species, which contradicts traditional niche based theory. This study highlights the potential relationship of local species richness to larger scale biodiversity patterns and the need to examine traditional theories of invasibility.

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#### Acoustic Courtship Songs of Species and Strains of the *C. flavipes* Complex in Kenya

*Cotesia* is a genus of parasitoid wasps (Hymenoptera: Braconidae) that has been widely used for biological control. The *Cotesia flavipes* complex contains three species, *C. flavipes*, *C. sesamiae* and *C. chilonis*, which are difficult to distinguish morphologically. *Cotesia flavipes* is distributed throughout the Indo-Australian region, *C. sesamiae* is found in Africa, and *C. chilonis* has been collected from Japan and China. These parasitoids have been used for biological control for stem boring moths that are pests of rice, sugar cane, maize and sorghum. In Kenya, *C. sesamiae* is native and *C. flavipes* was introduced for biological control of the introduced moth, *Chilo partellus*. The objective was to determine if acoustic courtship signals differed and could be used to distinguish between *C. sesamiae* and *C. flavipes*. Courtship songs have been employed to distinguish morphologically similar insects in other orders, but had not previously been used to differentiate closely related parasitoid wasps. The courtship acoustics of *C. flavipes* and two strains of *C. sesamiae* were recorded. Male *Cotesia* species fan their wings while courting females, producing a low amplitude sound and substrate vibration. Both the airborne and substrate vibrations produced during courtship were recorded and compared using laser vibrometry and a condenser microphone. The duration and frequency of song parameters were compared, and were significantly different for *C. flavipes* and the two strains of *C. sesamiae* ( $P < 0.05$ ). Investigating acoustic courtship signals of additional populations of *C. sesamiae* in Kenya may reveal cryptic species or strains.

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#### Beetle Diversity and Richness Comparisons Between *Juniperus* Managed and *Juniperus* Unmanaged Upland Evergreen Sites in the Texas Hill Country Area

Insects are the most diverse group of animals. The largest group of organisms at the ordinal level is the Coleoptera, or beetles. Entomologists have many variables to consider when surveying an area for insects. Issues such as trap type, location, and trapping season greatly influence the success of a species inventory. A trapping array designed for beetles operated at each of three sites in the Hill Country region of central Texas and consisted of four trap types: elevated flight intercept, ground level flight intercept, lindgren funnel, and pitfall. The trapping arrays operated from September 17, 2005-October 5, 2006, and samples were recovered monthly for twelve total sampling periods. More than 13,000 specimens representing more than 400 species were collected. Beetle species richness and abundance were examined to analyze the effectiveness of each trap type. In terms of richness, the ground level flight intercept trap greatly outperformed the other traps and provided about half of the total richness for each sample period. Species by sample date analysis shows that the greatest species richness was taken in the spring. Species accumulation curves for each trap type indicate that a longer trapping period would continue to significantly increase the total number of species captured.

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#### Behavior and Movement of Southern Right Whales: Effects of Boats and Swimmers

Guidelines for sustainable swim-with-cetacean tourism for large whales are not well-developed, as researchers have focused on delphinids. As a result, the fast-growing worldwide swim-with-whales industry is lacking the research needed to create successful management guidelines that can be implemented by local communities. In 2005 and 2006, we collected behavioral state data for southern right whales in proximity of swimmers at Península Valdés, Argentina. Whales were observed before, during, and after a series of directed interactions with swimmers. We quantified the behavioral effects relative to group composition (mother/calf pairs, juveniles or adult/mixed groups) of whales. Group composition had a significant effect ( $p < 0.05$ ) on the response of whales to swimmers. Resting and socializing activities significantly decreased and traveling activities significantly increased ( $p < 0.05$ ) during interactions. Whales swam faster, reoriented more often, and followed a less linear path during interactions. Effects were greater for mother/calf pairs than juveniles, while mixed adult/juvenile groups showed the smallest changes in behavior and movement. The initial reaction of whales to the approach of the boat and the entry of swimmers into the water was a good predictor of the magnitude of effects on the behavior and movement patterns of the whale. Increased levels of activity are a concern for the whales that are resting and not feeding in this area. Recommendations provided here should be combined with input from other local sources to develop regulations that are practical to implement and enforce and minimize the impact on the whales.

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#### Distribution of White-Tailed Deer Relative to Prescribed Burns on Rangeland in South Texas

Patch disturbances on rangeland have been shown to attract and concentrate herbivore activity. Specifically, fire may enrich the soil and allow fresh, new growth of vegetation. On a semi-arid rangeland we studied the distribution of white-tailed deer (*Odocoileus virginianus*) relative to these burned patches. Within a 2,100 ha pasture we burned 3 areas of 40 ha each in September 2005. In 5 trials we captured and fitted 3 bucks and 3 does with GPS telemetry collars (Lotek GPS 3300s). Collars were programmed to take a position fix every hour for 30 days. A pre-treatment trial in August 2005 showed that the future treatment areas were under-utilized by deer. An increase in the use of the treated areas was seen in November 2005, but declined in subsequent trials (March, July and October 2006). Whether this is due to reduced browse, loss of escape cover, or natural weariness are unknown at this point. However, greening of the burn was only evident in November. This is most likely due to drought conditions that limited vegetative regrowth in 2006. The Animal Movement Extension in ArcView 3.2 was used to calculate 50 and 95% monthly home ranges. This study provided little evidence that white-tailed deer are attracted to burned areas, however, there was little regrowth of vegetation during the study period. As such, prescribed burning alone may not be effective in semi-arid regions with low fine fuel loads due to erratic rainfall patterns which limit the response of the vegetation to treatment.

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Population Genetic Structure of *Conophthorus ponderosae* Hopkins (Coleoptera: Scolytidae) Inferred from Mitochondrial DNA Haplotypes

Pine cone beetles (*Conophthorus* sp.) are serious pests of many forest ecosystems since they burrow into pine cone tissues for egg deposition, causing the death of the seeds. Management of these beetles in natural and commercial stands of pines has been problematic due to lack of understanding about species limits and distribution. This study was conducted to investigate the phylogeography and phylogenetics of the genus by focusing on the polyphyletic *C. ponderosae* and the monophyletic *C. edulis*. Exactly 751bp of the mtDNA CO1 gene were sequenced to address population structure and possible historical influences on the *C. edulis* and *C. ponderosae* populations using a nested clade analysis of the mtDNA haplotypes. Three separate haplotype networks were found for the *C. ponderosae* haplotypes, indicating that there have been at least three lineages that have associated with *P. ponderosa*. At the species level, association with geography is variable. Population structure for *C. ponderosae* at the species level is minimal, and suggests that there has not been much time for lineage sorting of the haplotypes based on the nested clade analysis as compared to *C. edulis*.

**Lavell Merritt, Jr., Department of Recreation, Park and Tourism Sciences, Texas A&M University**

Sun, Sea, and Sand: Piping Plover and People: A Case Study Evaluating Public Involvement

Local communities, individuals, visitors, and special interests groups are often called upon to participate in the decision making processes of the National Park Service (NPS). Cape Hatteras National Seashore is engaging in a negotiated rulemaking process on visitor uses along its seashore. The rulemaking process is based on achieving consensus (Cape Hatteras National Seashore: Negotiated Rulemaking Feasibility Report, 2006). This paper uses Senecah's (2004) Theory Trinity of Voices to analyze this rulemaking process and to suggest critical dimensions for achieving widespread social legitimacy, and thus improve the likelihood that the NPS will be able to achieve its goals. The methods of this case study involved interviews with park staff, analysis of documents by stakeholders and the NPS about the conflict.

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Factors Influencing Algal Biomass in Hydrologically Dynamic Ponds in a Subtropical Salt Marsh Landscape

The interface between land and water is often a dynamic zone that responds to relatively short-term climatic and hydrologic forces. Coastal salt marshes occupy this zone between land and sea and typically are comprised of vegetated marsh intersected by channels and shallow ponds that are subject to flooding by winds, tides, and storm surges. Coastal salt marshes are widely regarded as zones of high macrophyte productivity. However, microalgae may contribute more to salt marsh productivity than previously realized, underscoring the importance of understanding algal dynamics in such systems. Benthic and planktonic algal biomass (as chlorophyll-a), sediment AFDW, total suspended solids, salinity, and nutrients were examined in marsh ponds in the subtropical Guadalupe Estuary, TX, USA to determine the effects of hydrologic connections on a major primary producer in this system. From May 2005 – May 2006 there were several pond connection, disconnection, and desiccation events. During periods of disconnection, algal biomass was higher in both the benthos and the water column than during connection events when supposed flushing occurred. Connection events also flushed out high NH<sub>4</sub> accumulating in pond surface waters, but did not increase NO<sub>x</sub>. Therefore, the primary source of DIN seemed to be nutrient cycling within the ponds. There was a temporal effect on surface water salinity, which increased throughout the sampling period as bay water levels and subsequent pond connections decreased, demonstrating the link between seasons (wet vs. dry) and marsh inundation patterns (high water periods vs. low water periods) in this estuary.

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Development of a Thyroid Stimulating Hormone Challenge Test to Evaluate Thyroid Disruption in Red Drum (*Sciaenops Ocellatus*)

Thyroid hormones are important in regulating growth, development, metabolism, and reproduction in vertebrates. Disruption of thyroid function by environmental contaminants may therefore have adverse consequences for wildlife populations. Current thyroid axis disruption assays evaluating blood thyroid hormone levels or thyroid follicle diameter as endpoints require prolonged treatment or often yield ambiguous results. The objective of this study was to determine if a thyroid stimulating hormone challenge test could serve as a practical alternative for evaluating changes in thyroid sensitivity to stimulation. Studies were performed on red drum (*Sciaenops ocellatus*), an estuarine fish widely distributed across the gulf coast and currently being developed for recreational and aquaculture uses. Initially red drum showed a time and dose dependent release of thyroid hormones in response to injection of bovine thyroid stimulating hormone (bTSH). Over 11 weeks, however the fish became insensitive to bTSH injections. To test the hypothesis that insensitivity to bTSH in red drum was linked to a diet, fish were fed a diet or a laboratory manufactured diet and challenged with bTSH. Within 21 days fish fed the commercial diet had a significantly lower thyroid hormone response to bTSH injections than fish fed the laboratory diet. These experiments suggest exposure to endocrine disrupting chemicals in diet desensitized red drum to bTSH injections. TSH challenge tests may thus be a viable method for evaluating thyroid axis disruption in wild or aquacultured red drum.

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The Effects of Environmental Fluctuations on Population Interaction Webs: Diversity Begets Stability, or Vice Versa?

Interaction webs are networks of populations interlinked by trophic as well as non-trophic relationships. All natural interaction webs are assembled and persist in environments that exert perturbations in living conditions. In this study, we focus on the effects of external fluctuations on interaction web succession (the development and stabilization of species composition and interaction structure). To generate predictions about the effects of different kinds of fluctuations on web dynamics, we use a network-theoretic approach. The basic structure is a weighted, directed graph with nodes representing populations and edges the interactions between them. To consider the effects of environmental stochasticity realistically, we use observed patterns in environmental variables (such as climate) to motivate the models. The results provide interesting new insights, and explicit predictions about the effects of environmental uncertainty on dynamical and structural properties of interaction webs. Our analyses show that environmental fluctuations can select on certain life-history parameters of component populations, resulting in the assembly of persistent webs with characteristic properties. Given sufficient time for succession, both, dynamical properties such as stability and growth rates (of component populations), and structural features such as species richness, connectance, degree distribution and chain lengths can be expected to be consistently associated with the pattern of stochasticity in the external environment. We also demonstrate that our results are robust to a wide range of variation in model parameters and types of environmental stochasticity. Finally, we evaluate some of the predictions with data from real-world webs along natural environmental gradients.

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Sea Turtle Conservation, Tourism, and Urban Development in the Area of Environmental Protection of the Northern Coast, Bahia, Brazil

The effectiveness of the efforts to integrate ecosystem conservation and tourism development is the focus of this study. Stakeholder involvement in decision-making has been key in the impact analysis and mitigation process of requested conservation zoning changes in the North Coastline Area of Environmental Protection (APA), Bahia, Brazil. APA has the difficult mission of protecting biodiversity and promoting sustainability in an area of increasing tourism and urban development. This study analyzes the outcomes zoning changes can have on sea turtle protection. Expected outcomes are based on information gathered from public meetings, community interviews, and planning/conservation reports. The study revealed that stakeholders welcome tourism economic benefits, but are concerned with possible impacts. By outlying requested changes and examining current conservation strategies, social and ecological implications are expected to arise. Without integrated participation and the maintenance of APA's conservation regulations, development pressure can challenge efforts for biodiversity conservation and impact local livelihoods.

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Do Female Mosquitoes Make Oviposition Decisions Based on Larval Experience With Predators?

The mosquitofish, *Gambusia affinis* is a widely-used mosquito control agent that is often introduced into larval habitats. A recent study suggested that the chemicals emitted by mosquitofish influenced the oviposition behavior of female *Culex* mosquitoes in the field. Other studies have shown that natal habitat influences female oviposition decisions in the lab. This study examined the impact of larval experience with chemicals emitted by predatory mosquitofish and the oviposition decisions made by adult female *Culex quinquefasciatus*. Larval mosquitoes were reared under three different treatment regimes: in pans with mosquitofish (separated by a screen that allowed water flow but not movement of larvae or fish) fed Tetramin® fish food (the same diet that larvae received), pans with mosquitofish fed conspecific mosquito larvae (at 10-20 larvae per day), and pans without fish at all. Following emergence and blood-feeding, gravid females were then offered a choice of four different oviposition habitats reflecting the three rearing treatments and distilled water. The mean number of egg rafts counted in the different oviposition substrates revealed no significant differences when analyzed with one-way analysis of variance. Females did not preferentially choose to oviposit in their natal habitat and laid eggs in habitats that had previously contained predatory fish regardless of experience. These data suggest that chemicals produced by mosquitofish may not be oviposition deterrents in and of themselves, as previous studies have suggested.

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Independent Effects of Male and Female Density on Male Competition for Mates in the Western Mosquitofish

Operational sex ratio is a major determinant of male competition for mates. The contributions of male and female density per se to mating system dynamics, however, are rarely considered and implied to be equal in Emlen and Oring's original hypothesis. Male western mosquitofish *Gambusia affinis* (Poeciliidae) compete for fertilizations by chasing rival males, displaying towards other males, and frequently copulating with females. I manipulated male and female density in a 2x2 factorial design and found that males chased rivals more often but attempted fewer copulations when operational sex ratio was male-biased. Surprisingly, this difference was largely due to changes in female density; male density had no significant effect. In contrast, agonistic displays between males increased with male density but were unaffected by female density. These results suggest that male and female density do not always contribute equally or at all to the patterns of behavior we observe.

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#### Estimating Population Densities of the Endemic Sand Dune Lizard (*Sceloporus Arenicolus*)

Distance sampling methods are widely used to estimate population densities of many taxa. How reliable are the estimates? We used distance sampling to obtain population density estimates of the endemic sand dune lizard (*Sceloporus arenicolus*) throughout its distribution in New Mexico. To test the feasibility and precision of distance sampling on *S. arenicolus*, distance estimates were compared to densities obtained from total removal plots. Distance estimates ( $n = 253$  transects) for *S. arenicolus* and all lizard species combined were 4.6 lizards/ha and 26.14 lizards/ha, respectively. Density estimates from the total removal plots ( $n = 20$ ) were 30 *S. arenicolus*/ha and 90 lizards/ha. The large difference in density estimates from distance sampling and total removal plots probably resulted from detectability issues during distance sampling. We used a linear regression to test the correlation between the two sampling methods to determine if the bias in density estimates is consistent. If a linear relationship existed between the sampling methods a correction factor can be applied. The regression results suggested no linear relationship between the two methods ( $y = 0.27x + 0.413$ ;  $R^2 = 0.28$ ;  $n = 10$  sites). *Sceloporus arenicolus* occupies habitat that is currently subject to oil and gas development resulting in habitat loss and fragmentation. Stakeholders are interested in population density estimates of this state endangered species throughout its range to facilitate better land management. Although distance sampling is a low cost method, further research on detection probability estimation is needed before densities calculated with this can be used with confidence.

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#### Does Male White-Tailed Deer (*Odocoileus Virginianus*) Social Dominance Fail During the Peak of the Rut?

The breeding structure of white-tailed deer has been described as dominance based. In age-structured populations relatively few dominant males were thought to do most of the breeding. However, recent studies have documented the successful breeding of all age classes. We sampled litters of offspring from the King Ranch in south Texas from 2000 thru 2006. Seventeen microsatellite loci were used to assign genetic paternity to 70 litters, with estimated conception dates. Mature males successfully sired 65% (45/70) of all litters, while yearling males (1.5 yrs old) sired 14% (10/70) and 2.5 year old males sired 21% (15/70). The average date of peak breeding (December 7th) did not differ between age classes. Although breeding success was distributed evenly throughout the season for 2.5 year old and mature males, successful breeding for yearling males was restricted to the period of peak breeding activity. This suggests that during the early part of the breeding season mature males are able to assert their social dominance. But as the rut begins to peak, and more does become receptive, mature males are no longer able to control the breeding rights to females allowing for immature bucks to successfully breed.



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#### The Use of Hydrogen Stable Isotopes in Studying the Hydrology of Aquatic Ecosystems

Hydrogen isotope analysis has been increasingly used in ecological research over the last several decades, primarily to answer questions regarding long-distance migration of birds. Due to the increased rate of evaporation of the lighter hydrogen isotope, global meteoric processes result in a latitudinal gradient that exists in hydrogen isotope signature from the poles to the equator. If a similar gradient occurs in smaller scale systems where bodies of water are subjected to distinct evaporation regimes, analysis of H isotope ratios may shed light on the hydrological processes that govern those systems. That gradient could also be exploited for studies of animal movement patterns on a smaller scale than large migrations. We tested this hypothesis on a 12,000 ha reserve in southwestern Georgia which has two distinct aquatic systems—a precipitation and groundwater-fed riverine system and precipitation-filled isolated seasonal wetlands. We sampled water every month from the same twelve locations along a 15 km stretch of creek and in 24 seasonal wetlands from July 2005 to October 2006 and analyzed the samples for their hydrogen isotope ratio. We found that the isotopic signatures of the wetlands showed far greater variation than those of the creek. However, the wetland values were consistently higher than those of the creek, indicating the higher evaporative regime of the wetlands was reflected in their isotopic signature. This study is the first step towards a novel use of H isotopes in ecological studies.

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#### Dusky Dolphins Influence Feeding Efficiency of Seabirds, Fur Seals, and Sharks

While interspecies feeding aggregations in marine environments commonly form around delphinids, the role of dolphins in the foraging ecology of other predators is largely unknown. In this study, we investigated the role of dusky dolphins (*Lagenorhynchus obscurus*) in the foraging ecology of apex predators, from Aug.—Nov. 2005 and May—Aug. 2006 in Admiralty Bay, New Zealand. During 335 dusky dolphin-feeding bouts (51 observed underwater), we recorded underwater video, and collected data on numbers of predators, dusky behavior, and prey ball parameters. We found that composition of predator aggregations and dusky feeding tactics differed between spring 2005 and winter 2006. In spring, dusky herded prey to the surface; in winter, they appeared to feed on deep scattered prey. However, in winter and spring, other apex predators used dusky dolphins to locate prey more easily. Additionally, in spring, dusky appeared to increase prey accessibility for surface predators, by herding prey towards the surface. The majority of prey balls (51%) observed underwater ascended during the course of feeding bouts; 35% stayed at constant depth, and 14% descended. Additionally, as dusky swam under prey balls the majority (61%) of the time, dusky herding behaviors appeared to cause prey balls to ascend closer to the surface. Dusky potentially play an important role in the foraging ecology of apex predators: for example, Australasian gannets (*Morus serrator*) fed with dusky 40% of the time and shearwaters (*Puffinus* species) fed with dusky 24% of the time. Other seabirds, fur seals, and sharks also frequently fed with dusky.

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#### GIS Modeling of Large Benthic Invertebrate in Respect to the Deep Currents off the Coast of North Carolina

The objective of this research is using the modern technology, such as GIS modeling, multivariate analyses, and ocean satellite data to test the hypotheses and conclusions of Rowe and Menzies's research (1968, 1969), and seeking the new insight from old data. The quantitative benthic invertebrate data was derived from the bottom photographs offshore North Carolina in the area bounded by the 32° and 34° latitudes and 77° and 71°W longitudes. The cluster analyses reveals 11 significant groups and were categorized into three major areas, including Archibenthal of transition, upper/meso abyssal, and lower abyssal zone. Base on the sea surface temperature, the Archibenthal zone seems related to the northward Gulf Stream and strong vertical environmental gradients. The high brittle star density in the upper/meso abyssal zone can be explained by a strong southward Western Boundary Undercurrent. In the lower abyssal zone, the environment does not change as drastically as the shallower end of the slope; therefore, the zonation is less obvious. In conclusion, the current conditions and water masses were the most important factor determine the animal distribution in our study area, because not only they can affect animal by transporting the larvae, but also by altering the dispersion of sediment and organic detritus.

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**Jon Moen, Department of Ecology and Environmental Science, Umeå University, Umeå, Sweden**

#### The Climatic and Herbivory Response in the Tree-Rings of Mountain Birch (*Betula Pubecens* Spp. *Czerepanovii*) In Northern Sweden

Trees growing at treeline are at their physiological limit in arctic and alpine systems and are highly susceptible to variations in climate. This study investigates the impact of climate, cycles of moths (*Epirrita autumnata*) outbreaks and reindeer (*Rangifer tarandus*) herbivory on the treeline of northern Sweden. Tree cores were taken from mountain birch (*Betula pubecens* ssp. *czerepanovii*) and from scots pine (*Pinus sylvestris*) in two different herding districts. In this study we established the climatic signals of temperature, precipitation and NAO indices (monthly and seasonally) with in the tree rings. Variations between the pine and birch climatic responses will hopefully correspond to known outbreaks of moths and high reindeer densities. Our hypothesis is that there will be negative growth response during moth outbreaks and high levels of herbivory. We also expect a positive growth response and establishment period subsequent to attacks and declines in reindeer populations.

**Cody Zilverberg, Department of Agricultural Economics, Texas A&M University**

#### Population Growth and Fertilizer Use: Ecological and Economic Consequences in Santa Cruz del Quiché, Guatemala

Concern that the world's food productive capacity will not keep pace with its population growth has persisted since Malthus published his famous essay in 1798. However, technological advancements and the conversion of previously uncultivated land to agriculture have kept global food production ahead of the increasing demands of the rapidly growing population although regional shortfalls have occurred. The population of Santa Cruz del Quiché, Guatemala has been growing exceptionally fast in recent decades, thereby increasing the demand for and pressure on agricultural land. In response, farmers have reduced the use of fallow periods, reduced the amount of land dedicated to forest and pasture, and increased the quantity of synthetic fertilizer applied. Specifically, farmers with less land tend to apply less organic fertilizer. Ecological consequences of these agricultural changes include loss of soil organic carbon, reduced water infiltration and concomitant increased runoff, and increased soil erosion. A parallel economic consequence of this shift in land fertilization practices is that farmers rely more heavily upon purchased fertilizer, making them vulnerable to global price increases. Policy instruments that may resolve these problems include implementing a conservation program, producing alternative organic fertilizers, increasing nitrogen use efficiency, promoting economic development, and using improved seeds.

Thank you for attending the eighth annual Ecological Integration Symposium. We hope this has been an educational and enjoyable experience.

EIS is looking for committee members for the ninth annual symposium. If you would like to be involved, please contact any of the members of this year's planning committee, who will be happy to give you more information. Or, email [eis@ag.tamu.edu](mailto:eis@ag.tamu.edu).