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POSTER ABSTRACTS
(in alphabetical order by presenter's last name)

GOLI ARDESTANI

International Rice Research Institute (IRRI) and University of the Philippines, Los Baños, Laguna, Philippines
Master's completed

Coauthors:

Diana Rose Rogello, University of the Philippines, Los Baños, Laguna, Philippines
Roberto C. Reyes, University of the Philippines, Los Baños, Laguna, Philippines
Rita P. Laude, University of the Philippines, Los Baños, Laguna, Philippines

GENETIC DIVERSITY OF TWO THREATENED FRESHWATER GOBY SPECIES IN THE PHILIPPINES

Understanding the genetic diversity and variation of fish species is important to better inform decision-making in any planned conservation programs. This is the first study in the Philippines to measure the genetic diversity within and among the natural populations of two native and threatened freshwater fishes: *Glossogobius celebius* (Valenciennes) and *Glossogobius giuris* (Hamilton) through isozyme analysis. Samples were collected from lake and river ecosystems considered as biodiversity conservation priority areas in the Philippines. Inter and intra-population estimates of genetic diversity for each species based on the average number of alleles, observed and expected heterozygosity, percentage of polymorphic loci, gene flow and pairwise F_{ST} were determined. Results revealed a higher degree of genetic variation among *G. giuris* populations, while a higher genetic diversity was detected within each population of *G. celebius*. Computed pairwise F_{ST} values show that the presence of environmental factors even in adjacent ecosystems could restrict gene flow resulting to significant genetic variation between populations. This study confirms the need for immediate conservation interventions for *G. giuris* as its low intra-population variability could be a result of successive bottleneck events that if unabated would lead to loss of genotypes. On the other hand, the higher degree of intra-population heterozygosity and polymorphism among *G. celebius* could be likely due to its higher adaptation to various environmental conditions thereby providing initial indication of its potential for captive breeding. Higher genetic variation within each population is necessary to reduce inbreeding and allow the population to adapt to environmental challenges.

NILOUFAR BAYANI

Department of Ecology, Evolution and Environmental Biology, Columbia University, New York, NY, USA
Master's, 2nd year

Coauthors:

Elisa Bone, Department of Ecology, Evolution and Environmental Biology, Columbia University, New York, NY, USA

Caleb McClennen, Director of Marine Conservation, Wildlife Conservation Society, New York, NY, USA

Claire Paris, Rosenstiel School of Marine and Atmospheric Science, University of Miami, Miami, FL, USA

EFFECTS OF CHANGING CORAL COVER ON REEF FISH RECRUITMENT IN THE CARIBBEAN

Caribbean coral reefs are undergoing a shift from being dominated by healthy coral colonies to higher coverage of fleshy macroalgae, with potential negative effects on the fish community. The goal of this study was to understand whether this shift in habitat affected the recruitment of fish larvae into coral reef communities within a Caribbean atoll. The abundance of newly settled juveniles was repeatedly surveyed at 14 sites in lagoon, forereef and channel habitats within Glover's Reef Atoll, Belize in June and July 2011. Total abundance and species diversity of recruits could not be explained by any of the habitat (coral cover, relative abundance of macroalgae, depth and structural complexity) or fish community variables (abundance of conspecifics, piscivores and generalist carnivores). However, at the family level, adult abundance positively affected the abundance of Pomacentrid recruits, whilst both depth and the abundance of generalist carnivores explained the abundance of Scarid recruits. Further, habitat and fish community variables affected recruitment of 4 of the most common species, suggesting that changes to habitat composition may be affecting settlement site selection by late-stage larvae. We discuss the implications for local coral reef conservation in the face of further reef degradation and the importance of considering habitat heterogeneity at an adequate spatial scale to detect differences in recruitment patterns.

EMILIA BRAGA

Laboratory of Vegetal Ecology

Ecology Department, Biology Institute (IB), University of Brasília (UnB), Brazil

Ph.D., 2nd year

Coauthors:

Adriano J. B. Souza, Center for Science Education (NECBIO), Ecology Department, Biology Institute (IB), University of Brasília (UnB), Brazil

Gustavo F. M. Leite, Center for Science Education (NECBIO), Ecology Department, Biology Institute (IB), University of Brasília (UnB), Brazil

USING QUALITATIVE REASONING TO MODELLING THE INVASIVENESS OF ALIEN GRASS INTO SAVANNA

Invasive species have impacts on the communities that they invade, and understanding these impacts may aid in reversing them. Ecological interactions between native and invasive species may be direct or indirect, resulting in changes in the native populations, affecting local ecologic processes. The molasses grass (*Melinis minutiflora*) is an aggressive invader able to modify completely in few years a natural vegetation physiognomy, and its development and growing is well even in low fertility soils, as the Cerrado soils. The Qualitative Reasoning (QR) is an area of Artificial Intelligence (AI) engaged in describing physical and biological systems in order to derive behavior from system structure, grounding the dynamics of such systems in causal relations, when numerical data and precise information are unavailable. This work presents Molasses grass as an alien species, a qualitative simulation model representing the effect of invasion and its expansion in natural areas of Cerrado vegetation. The model was built and implemented in the DynaLearn workbench (www.dynalearn.eu). The simulation shows that, when disturbance is

present, the Cerrado's resistance to invasion decreases, decreasing the vegetal biodiversity too, increasing the invasiveness of the area, allowing the entry, establishment and expansion of molasses grass. The model built is dynamic, so different scenarios can be mounted to simulate real or experimental situations, creating a casual chain that helps the understanding of the invasion process and may be used as a teaching tool at schools and universities, as well as to stakeholders for prevention and management. Acknowledgement to FAP-DF for financial support.

SHANNON BUCKLEY

SUNY College of Environmental Science and Forestry, Syracuse, NY, USA
Master's, 2nd year

Coauthors:

Stacy McNulty, SUNY College of Environmental Science and Forestry, Syracuse, NY, USA
Thomas Hodgman, Maine Department of Inland Fisheries and Wildlife, Bangor, ME, USA

NEST PREDATION AND HABITAT OF THE DECLINING RUSTY BLACKBIRD (EUPHAGUS CAROLINUS)

The Rusty Blackbird (*Euphagus carolinus*) has experienced one of the most significant declines ever documented among extant North American birds. While the cause of the decline is not yet understood, one possible factor is increased nest predation in regenerating clear-cuts. Previous studies found nests in wetlands adjacent to logged areas suffered significantly higher predation than nests in undisturbed forested wetlands. The identity of the predators responsible and their habitat associations, however, remained a mystery. We addressed this question using motion-triggered trail cameras to monitor natural Rusty Blackbird nests and measuring habitat parameters around nests at multiple spatial scales. To minimize disturbance, we used covert infrared camera models (Reconyx Hyperfire HC600, Bushnell Trophy Cam or Uway NightTrakker NT50B IR). From May-August 2011, we monitored 13 Rusty Blackbird nests in the Moosehead Lake region of central Maine. Ten of these were monitored with a camera during some or all of the nesting cycle. Of ten camera-monitored nests, six successfully fledged chicks, three were depredated and one was of unknown fate (though probably depredated). We captured images of two predation events: one by an *Accipiter* spp. and one by a white-tailed deer (*Odocoileus virginianus*). None of the camera-monitored nests were abandoned. We found no evidence that timber harvest around nests resulted in increased nest predation in 2011. Through camera footage of a little-understood and imperiled species, we are providing insight into nesting ecology and predation relative to habitat type that may aid in conservation efforts.

ROWSHYRA CASTANEDA

McGill University, Montreal, Quebec, Canada
Master's, 2nd year

Coauthors:

Anouk Simard, Ministère des ressources naturelles et de la faune, Quebec, Quebec, Canada
Anthony Ricciardi, McGill University, Montreal, Quebec, Canada

SOME LIKE IT HOT: AN AQUATIC INVADER (CORBICULA FLUMINEA) ALONG A THERMAL GRADIENT

The Asian clam *Corbicula fluminea* - one of the world's most invasive bivalves - was introduced to North America from Asia in the early 19th century and has spread throughout the United States, South America and Europe. Although the clam's physiological requirements appear to restrict its distribution to habitats where water temperatures exceed 2°C, it occurs in north temperate regions in artificially heated waterbodies. In November 2009, a population of the Asian clam was discovered in the St. Lawrence River in the thermal discharge plume of the Gentilly-2 power plant. During June-August 2011, sampling of the benthic community of the thermal plume at Gentilly was conducted to determine the distribution, abundance and condition of the Asian clam population. Benthic grabs were taken at sites inside and outside the thermal plume to test the following hypotheses: 1) *C. fluminea* has established reproducing populations within the plume; 2) its occurrence in the river is restricted to sites within the plume; and 3) its abundance and condition decline with distance from the power plant. The clam is well established throughout the 3-km length of the plume and, moreover, has achieved high densities similar to those in natural subtropical and tropical systems. Its occurrence is restricted to the plume and it declines in abundance along the gradient. Its condition does not seem to be affected by location along the plume. The plume may act as a refuge until warmer temperatures are realized in the river, thereby allowing the clam to spread into natural waters.

SARA COLLINS

Department of Biology, Carleton University, Ottawa, Ontario, Canada
Ph.D., 1st year

Coauthor:

Dr. Ronald Russell, Department of Biology, Saint Mary's University, Halifax, Nova Scotia, Canada

TOXICITY OF DEICING SALT COMPONENTS TO EARLY AMPHIBIAN LIFE STAGES

Chemical contamination is a primary factor contributing to worldwide amphibian declines. Toxic chemicals in road runoff water are known to negatively affect amphibians inhabiting roadside wetlands. Road salt (NaCl) is recognized as major pollutant in northern latitudes due to its extensive use as a deicing agent. Additionally, ferrocyanide anti-caking agents are released from road salt and effects on the environment are poorly understood. Amphibians are particularly vulnerable due to their permeable skin and eggs, and low tolerance to salt. The purpose of this research was to investigate the effects of environmentally significant acute and chronic NaCl exposures on early developmental stages of amphibians, and to determine the acute toxicity of cyanide to larval amphibians. Acute toxicity tests to NaCl and cyanide were performed on the larvae of five amphibian species native to Nova Scotia, Canada. Chronic toxicity tests at environmentally significant salt concentrations were performed on eggs and larvae of three species to assess effects on growth, development, survivorship, and behaviour. Test species included: spotted salamanders (*Ambystoma maculatum*), American toads (*Anaxyrus americanus*), spring peepers (*Pseudacris crucifer*), green frogs (*Lithobates clamitans*), and wood frogs (*Lithobates sylvaticus*). Median lethal concentration values were calculated from NaCl and cyanide acute toxicity experiments. Chronic NaCl exposure reduced hatching, increased mortality, and induced developmental and behavioural anomalies. These effects have the potential to inflict devastating consequences to populations in nature. Differential responses among species indicate that chloride is an important stressor influencing amphibian community structure in roadside wetlands.

APRIL CONWAY

University of Georgia, Athens, GA, USA
Ph.D., 4th year

Coauthors:

Sonia Hernandez, University of Georgia, Athens, GA, USA

John Carroll, University of Georgia, Athens, GA, USA

Lincoln Larson, University of Georgia, Athens, GA, USA

RURAL PEOPLES' ATTITUDES TOWARDS CONSERVATION NEAR TIWAI ISLAND, SIERRA LEONE

Global declines in biodiversity caused by anthropogenic factors are a major concern in conservation hotspots. Vulnerable species in these areas are often threatened by human populations whose survival directly depends on natural resource use. Research suggests that conservation programs should include a community-based component that considers the needs of people living near protected areas. This study focused on local residents' attitudes towards wildlife and conservation near Tiwai Island Wildlife Sanctuary (TIWS), a protected island on the Moa River in Sierra Leone. Survey questions addressed topics including crop damage, wild meat consumption, and resource use on TIWS. Surveys were administered in 27 villages to 522 people. Environmental education was conducted in 8 of the villages before the survey administration. According to respondents, the cane rat (43.7%) and red river hog (30.8%) caused the most crop damage. Wild-caught meat appeared to be an important food source for most survey respondents, with most respondents (69.1%) admitting that wild meat was "sweeter" than domestic meat. Most respondents were against unregulated resource use in Sierra Leone's protected areas: 65.4% opposed diamond mining on river islands and 81.0% opposed logging. Respondents from villages where education occurred were more likely to recognize conservation benefits and more likely to oppose unregulated use of natural resources on the Island. Results suggest that education programs influenced participants' awareness of conservation benefits and increased the likelihood for support for protection of Tiwai Island and wildlife. Data also validate the importance of programs that account for stakeholders' involvement in conservation activities.

SETH CUNNINGHAM

Fordham University, New York, NY, USA
Ph.D., 2nd year

Coauthors:

Mathew Shirley, University of Florida, Gainesville, FL, USA

Dr. Evon Hekkala, Fordham University, New York, NY, USA

GENETIC VARIATION AMONG CENTRAL AND WEST AFRICAN CROCODYLUS SUCHUS POPULATIONS

Understanding the phylogeographic history of widespread species is vital to implementing effective conservation and management strategies. Of primary importance, is the recognition of genetically differentiated populations as local management units. The Nile crocodile (*Crocodylus niloticus*) has been found to contain substantial biogeographic sub-structuring corresponding with major river drainages throughout Eastern Africa and Madagascar and to contain a cryptic species (*Crocodylus suchus*) in Central and Western Africa. Due to its heavy use in the leather industry and status as a trophy animal, the Nile crocodile lineages must be properly managed if they are to persist into the foreseeable future. In order to better understand the distribution, phylogenetics,

and possible sympatry in this region, specimens, corresponding to major river drainages throughout Central and West Africa, were obtained and analyzed using multilocus genotyping to evaluate population genetic differentiation. Populations from all sampled regions exhibited marked levels of genetic and genotypic differentiation as assessed by significant F_{ST} values and Bayesian analysis of population structure. Additionally, survey efforts indicate that *C. suchus* is declining or extirpated in much of its range, thus, reinforcing the importance of conservation and management plans that are underpinned by a robust understanding of the phylogeography of this cryptic species.

MARIANO ANDRES DE LA MAZA MUSALEM

Fauna Australis Wildlife Laboratory, Department of Ecosystems and The Environment, School Agriculture and Forestry Engineering, Pontificia Universidad Católica de Chile, Santiago, Región Metropolitana, Chile
Master's, 3rd year

Coauthors:

Tomás A. Altamirano, Fauna Australis Wildlife Laboratory, Department of Ecosystems and The Environment, School Agriculture and Forestry Engineering, Pontificia Universidad Católica de Chile, Santiago, Región Metropolitana, Chile
Cristián Bonacic, Fauna Australis Wildlife Laboratory, Department of Ecosystems and The Environment, School Agriculture and Forestry Engineering, Pontificia Universidad Católica de Chile, Santiago, Región Metropolitana, Chile

NEST BOX OCCUPATION BY DROMICIOPS GLIROIDES: RESEARCH AND CONSERVATION OPPORTUNITIES

Nest boxes are usually used for research and as a conservation strategy (habitat supply) for cavity-nesting birds. Nevertheless, some mammals may also be limited by the availability of natural cavities. This is the case of *Dromiciops gliroides* (Colo-colo opossum), a vulnerable South American marsupial considered a living fossil, usually studied with live traps placed in understory grids. In 2010, we installed 240 nest-boxes in six different forest stands, from early-successional to old-growth forests, with the aim of studying the reproduction biology of a cavity nesting bird. After 2 years of monitoring (November 2010 to February 2012), a total of 83 nest boxes (35%) were used by *D. gliroides*. The most common use was for hibernation (65%) followed by predation over nesting birds (50%) and reproduction (14%). We report, for the first time, adult bird predation by *D. g.* ($n=3$ adults) and a maximum communal nesting of 12ind/nest. Also, pictures of breeding behavior (adult with pups) were obtained with camera traps. Our results suggest a new approach to study the ecology and behavior of this rare marsupial. Moreover, nest boxes may serve as an important conservation tool increasing cavity availability for *D. gliroides*.

CATHERINE DOYLE-CAPITMAN

Yale School of Forestry and Environmental Studies, New Haven, Connecticut, United States
Master's, 1st year

MANAGING WHITE-TAILED DEER IN NORTHEASTERN NATIONAL WILDLIFE REFUGES

White-tailed Deer (*Odocoileus virginianus*) overpopulation in the Northeast United States has been associated with species exclusion, lack of forest regeneration, and increased pervasiveness of invasive species. These ecological impacts are particularly detrimental in National Wildlife

Refuges (NWRs), a nation-wide system of public lands maintained for the conservation of endemic wildlife and their habitats. To manage deer overpopulation, a number of northeastern NWRs historically closed to hunting have implemented controlled hunts in recent years. But in the face of protests against lethal methods and a mounting desire for public participation in wildlife management, particularly in urban-proximate areas where deer management is highly visible, managers are faced with the challenge of incorporating diverse stakeholder expectations in determining best management plans. The purpose of my study is to examine these challenging human dimensions of wildlife management from both managerial and stakeholder perspectives. First, I will elucidate the decision processes used in determining hunting to be the most appropriate and effectual mechanism for controlling deer populations in four urban-proximate, northeastern NWRs. Next, I will evaluate the level to which these programs are adapted and amended to contend with changing biological and social factors. Finally, I will determine how refuge and wildlife stakeholder opinions, concerns, and support are differentially weighted in management decisions. Preliminary interviews and document analysis indicate high levels of adaptive management in hunting programs, higher levels of conflict between refuge managers and non-consumptive stakeholders in areas with higher human population densities, and a general underrepresentation of non-consumptive stakeholders in deer management plans.

STACIE FLOOD

North Carolina State University Department of Plant Biology, Raleigh, NC, USA
Ph.D., 4th year

Coauthors:

JoAnn Burkholder, North Carolina State University Department of Plant Biology Professor, Raleigh, NC, USA

W. Gregory Cope, North Carolina State University Department of Toxicology Professor, Raleigh, NC, USA

ECOTOXICOLOGICAL EFFECTS OF AN AGRICULTURAL HERBICIDE ON ESTUARINE PHYTOPLANKTON

Despite the ubiquitous occurrence of atrazine in coastal watersheds, the ecotoxicological effects of this herbicide on estuarine phytoplankton are poorly known. We quantified the response of selected, ecologically important, cultured phytoplankton species to atrazine at environmentally relevant concentrations, using toxicological laboratory techniques. In addition, geospatial computer modeling was used to assess the probability of phytoplankton exposure to atrazine in a major estuary. The species tested thus far include *Dunaliella tertiolecta* (Chlorophyceae), *Prymnesium parvum* (Haptophyceae) and *Chattonella subsalsa* (Raphidophyceae). *Dunaliella* spp. are benign, whereas the other two species are toxigenic and have caused major fish kills in estuarine and coastal marine waters. Trials to date indicate the relative sensitivity of these species (in decreasing order) is *Chattonella subsalsa* > *Dunaliella tertiolecta* > *Prymnesium parvum*. These findings suggest that, as expected, harmful algae vary in sensitivity to this commonly occurring photosynthetic inhibitor. We plan to build on this work to assess the extent to which atrazine can facilitate dominance by harmful algal species and related major fish kills in brackish waters, and to quantify the extent to which nutrient supply ratios (N:P) can effect changes in the relative sensitivities of selected harmful algal species to atrazine exposure.

SETH GANZHORN

Fordham University, Bronx, NY, USA

Ph.D., 4th year

Coauthors:

James D. Lewis, Fordham University, Bronx, NY, USA

William W. Thomas, New York Botanical Garden, Bronx, NY, USA

Fernanda A. Gaiotto, Universidade Estadual de Santa Cruz, Ilhéus, Bahia, Brazil

Beatriz Perez-Sweeney, Fordham University, Bronx, NY, USA

GENETIC DIVERSITY OF AN ECOLOGICALLY AND ECONOMICALLY IMPORTANT TREE SPECIES

We examined how forest fragmentation affected the population genetics of the threatened tree species *Manilkara maxima* from the Atlantic coastal region of southern Bahia, Brazil. *Manilkara maxima* is economically important as a source of timber and identified as one of the top five “extremely valuable” tree species for conservation of the endangered golden-headed lion tamarin (*Leontopithecus chrysomelas*). The Brazilian Atlantic forest is considered a global “hotspot” with high conservation priority due to its abundant biodiversity and forest fragmentation. Fragmentation is expected to reduce tree density, allelic diversity and gene diversity, while increasing inbreeding and differentiation. We hypothesized relationships between forest fragment size and tree density and indices of genetic diversity. We sampled a total of 222 individuals from two large fragments (400 and 200 ha) and one site consisting of three 25, two 10, and three 5 ha fragments. Genomic DNA was extracted from leaves and cambium and five microsatellite loci were used for examining the population genetic diversity. Our findings suggest larger forest fragments maintain higher tree densities, but medium sized fragments can maintain high levels of genetic diversity for this threatened tree species. As forest size decreased, adult and juvenile tree density decreased, which is alarming considering the long-term sustainability of this tree, since only 5% of forests in this region are > 100 ha. Juvenile trees exhibited the greatest mean allelic diversity and gene diversity in the 25 ha forest when compared to the largest forest fragments. All sites exhibited moderate genetic differentiation ($F_{ST} = 0.12$).

KELSEY GRAHAM

Department of Biology, Tufts University, Medford, MA, USA

Ph.D., 1st year

Coauthor:

J. Michael Reed, Department of Biology, Tufts University, Medford, MA, USA

ESTIMATED DATES OF RECENT EXTINCTIONS OF NEW ZEALAND BIRDS

Non-controversial sight records and physical evidence of 12 New Zealand bird species were used to estimate the probable year that extinctions occurred as well as estimate likelihood of persistence beyond the last confirmed sighting record. Sighting records were compiled for 14 bird species and subspecies thought to have gone extinct in New Zealand since the 1870s, although for some there are recent controversial sightings. Of the 14, 12 had sufficient data for analysis. Of these 12, no species is likely to be extant (all $p < 0.05$); estimated years of extinction ranged from 1878 to 1981, with upper 95% confidence bounds ranging from 1887 to 1996. Therefore, more recent controversial sightings should be accepted only after falling under heavy scrutiny. This predictive model can be used as a tool for evaluating new and controversial evidence of persistence as well as assist conservationists with prioritizing resource allocation to those species deemed of highest concern for extinction threat.

STEPHEN HARRIS

CUNY- The Graduate Center, New York, NY, United States
Ph.D., 3rd year

Coauthors:

Marissa Bellino, CUNY- The Graduate Center, New York, NY, United States
Arlie O. Petters, Duke University, Durham, NC, United States

INTEGRATING EDUCATION AND BIODIVERSITY RESEARCH THROUGH DNA BARCODING IN NYC SCHOOLS

Urban areas are biodiversity hot spots as opposed to the barren landscapes they were previously believed to be. NYC is no exception and we work with high school classrooms to document biodiversity and aid in the conservation of local habitats in NYC through the use of DNA barcoding. High school students learn the process of creating DNA barcodes, how scientists use them to help in conservation, and then develop real projects and use bioinformatics to analyze results. Through a combination of teaching theoretical background knowledge and the practical skills necessary to carry out a barcoding project, we have successfully taught high school students how to develop research questions to investigate the biodiversity of NYC using DNA barcoding. Students work in small groups, identify a species of interest, collect samples from around the city for use in their barcoding projects, and prove that high school students can successfully contribute to scientific research. They have also developed a website to share their information and manage data with the hopes of having samples loaded into databases used by research scientists from around the world. We are developing curriculum resources and are working to replicate this model in high schools as a way to promote evolution education, increase student interest in conservation, and implement scientific research outside of the college academic setting. Besides NYC, we have successfully implemented a mirror project with local students in Dangriga Belize looking at conservation and the urban to rural gradient from urban Dangriga to the rural tropical forest.

FABIO HERNANDES

Dep. Zoologia UNESP - Univ Estadual Paulista, Rio Claro, São Paulo State, Brazil
Ph.D. completed

NEW FEATHER MITES (ARACHNIDA: ACARI) OF ENDANGERED PASSERINES (AVES) IN BRAZIL

The habitat loss is a continuous threat to endangered species, especially for those whose occurrence is restricted to small geographical areas. Feather mites (Arachnida: Acari) form a diverse group of parasites and commensals intimately associated with their avian hosts: a feather mite species is usually associated with a single host or with a group of related hosts; nearly 2500 species are currently known from all birds orders. The world's richest spot in bird fauna, i. e. the Neotropics, was not thoroughly studied concerning their feather mites, therefore many of these birds still harbor large numbers of undescribed mites, given that each bird usually host on average two to three mite species. Herein we outline the preliminary results of a survey of feather mites associated with two endangered passerines endemic to Southeastern Brazil. The birds were captured using mist nets and were released after examination of the feathers. Two new feather mite species were discovered associated with the Restinga Tyrannulet, *Phylloscartes kronei* (Rhynchociclidae) from the genera *Trouessartia* (Trouessartiidae) and *Nycteridocaulus*

(Proctophyllodidae); and at least one undescribed species of Nanopterodectes (Proctophyllodidae) associated with the Parana Antwren, *Stymphalornis acutirostris* (Thamnophilidae). Those species will be described in the near future. We conclude that although the conservation of endangered species is clearly important for the preservation of the biodiversity, especially in developing countries like Brazil, the need for conservation becomes even more obvious and urgent when one realizes those species still host many undescribed feather mites.

JANE HERRERA

National Museum of Natural History of Cuba, Havana City, Havana, Cuba

Coauthor:

Thierry Backeljau, Royal Belgian Institute of Natural Sciences, Brussels, Belgium

MOLECULAR TAXONOMY OF THE VIANA REGINA SPECIES COMPLEX IN CUBA (GASTROPODA)

The Phylum Mollusca represent, after the Arthropods, the most numerous group of the Animal Kingdom. The Cuban archipelago has 1 300 species of terrestrial mollusks. They have many characteristics like a high diversity of taxonomic forms, the microlocalization of numerous species and the most of them are endemic (96%). This zoological group has an enormous importance because is a decisive factor in the ecological balance of the ecosystems and contain a considerable number of species of direct interest for man: plague, vectors of illnesses, food, biological controls and bioindicators. *Viana regina* (Morelet, 1849) is an endemic species of Viñales Valley (National Park declared in 1999 as World Heritage Site by the Unesco). This genus contains three subspecies according to Clench and Jacobson in 1968. My research paper deals with the taxonomy, evolution, conservation and population structuring of an endemic genus of Cuban terrestrial operculate gastropods, viz. the genus *Regina*. The species of this taxon have a high conservation status as they have become a “flagship” taxon among Cuban endemics. For this research I determined DNA nucleotide sequences of several mitochondrial and nuclear genes in all known nominal taxa and populations of *Regina*. It is very important know the biodiversity of the hotspots for conservation priorities.

BRENT JOHNSON

State University of New York College of Environmental Science and Forestry, Syracuse, NY, USA
Master's, 1st year

Coauthors:

James P. Gibbs, State University of New York College of Environmental Science and Forestry, Syracuse, NY, USA

Thomas Bell, New York State Department of Environmental Science and Conservation, Cortland, NY, USA

HABITAT MANIPULATIONS AS A CONSERVATION STRATEGY FOR EASTERN MASSASAUGA RATTLESNAKES

Sistrurus catenatus catenatus (Eastern Massasauga Rattlesnake, EMR) is in danger of extinction and adapted to wetland habitats with low plant cover. Habitats for this subspecies are rapidly being lost in the northeastern U. S. through woody plant succession. In spring 2011, the New

York State Department of Environmental Conservation created 32 basking plots, a 10-acre clear-cut, and two 5-acre forest thinnings at a wetland site to increase suitable basking habitat for the EMR. Associated monitoring of snake response involves assessing changes in habitat use and preference by EMRs in response to manipulations and estimation of rates of growth, survival, and reproduction to better understand the current status of the population. Visual surveys are being conducted three times per week during 2011 and 2012 seasons to determine sighting frequency of snakes among habitat types. In 2012, the influence of habitat type on environmental temperatures and ability of the EMR to avoid predators will be evaluated. Preliminary results from the 2011 season indicate strong, positive response by EMRs to newly created openings. To develop estimates of demographic parameters, data will be combined from field studies conducted from 2006-2010. We are also determining rates of succession within critical habitat areas through inspection of a time series of aerial photographs to develop a plan for long-term maintenance of quality basking sites. Lessons learned from this study will ultimately help to conserve the EMR and other snake species in the northeastern U. S. threatened by forest succession.

BRITTNEY KAJDACSI

Department of Ecology and Evolutionary Biology, Yale University, New Haven, CT, USA
Ph.D., 1st year

Coauthors:

Ryan C. Garrick, Department of Biology, University of Mississippi, University, MS, USA

Michael A. Russello, Department of Biology, University of British Columbia, Okanagan Campus, Kelowna, BC, Canada

Edgar Benavides, Department of Ecology and Evolutionary Biology, Yale University, New Haven, CT, USA

Chaz Hyseni, Department of Ecology and Evolutionary Biology, Yale University, New Haven, CT, USA

James P. Gibbs, College of Environmental Science & Forestry, State University of New York, Syracuse, NY, USA

Washington Tapia, Galápagos National Park Service, Puerto Ayora, Galápagos, Ecuador

Adalgisa Caccone, Department of Ecology and Evolutionary Biology, Yale University, New Haven, CT, USA

THE HISTORICAL CONTEXT OF RECENT POPULATION BOTTLENECKS IN GALÁPAGOS TORTOISES

Genetic bottlenecks have been of long-standing concern because they can increase extinction risk via inbreeding depression and reduced adaptive potential. This classic view may be overly simplistic, given emerging empirical and theoretical evidence suggesting that under certain circumstances, these events can purge from a population the deleterious recessive alleles that trigger inbreeding depression; thus impacting the present-day risks of inbreeding depression faced by threatened and endangered species. We have reconstructed the long-term demographic history of Galápagos tortoises (*Chelonoidis* sp.)—a group of immediate conservation concern—to better understand the historical context of recent and severe human-induced population bottlenecks. Inferences for 15 populations of closely-related Galápagos tortoise species were based on datasets containing genotypic, allelic frequency, and phylogenetic information. Using a complementary set of analyses, we attempted to separate different ‘time slices’ of demographic history. We found that prior to the human-induced bottlenecks, some populations persisted at small sizes for a long time, and so, may have already purged deleterious recessive alleles, whereas other populations were previously very large, and therefore, may carry a substantial

genetic load. Additionally, comparisons of contemporary effective population size versus census size indicated negative density-dependent reproductive success. Collectively, these snapshots provided new insights into present-day extinction risk of Galápagos tortoises owing to inbreeding depression. Our data suggest that the predominant forces affecting Galápagos tortoise population sizes were idiosyncratic rather than archipelago-wide, thereby necessitating a case-by-base assessment of the relative importance of inbreeding depression versus reduced evolutionary potential as causes of conservation concern.

RACHEL LAURIE

Antioch University New England, Keene, NH, USA

Master's, 4th year

Coauthors:

Beth Kaplin, Antioch University New England, Keene, NH, USA

Alejandro Estrada, Universidad Nacional Autónoma de México, Veracruz, Mexico

AN ASSESSMENT OF PRE AND POST RELEASE BEHAVIOR IN A GROUP OF MEXICAN SPIDER MONKEYS

I studied behavior in a group of captive Mexican spider monkeys (*Ateles geoffroyi vellerosus*) before and after their release onto a 0.16 hectare island on the grounds of Aluxes Ecopark, Chiapas, Mexico in April 2010. My goal was to aid future reintroduction efforts by evaluating the role of an enriched and complex environment in eliciting natural behavior in this endangered species. Instantaneous focal sampling was used to record behavior for 9 weeks before and 9 weeks after the release. Results show that the monkeys explored the island, using its novel features (e. g., increased space and access to trees) in species-specific ways. The monkeys also recovered their natural tendency to spend time alone or in smaller groups once out of the confines of the cage and on the island. Regardless of their enclosure, the group's grooming and embracing behavior, preference for height, and limited terrestrial use were all congruous with what we know about wild spider monkeys. However, even after release, the group was more stationary than most wild groups and certain individuals continued to exhibit stereotypical behavior. Given this unique opportunity, I also studied whether grooming and embracing relationships changed after the transfer and found that they did not, which suggests that affiliative behavior observed in a cage may be relied on to guide decisions about release group composition.

COURTNEY LEE

Texas A&M University at Galveston, Galveston, Texas, USA

Master's, 2nd year

Coauthor:

Anna Armitage, Texas A&M University at Galveston, Galveston, Texas, USA

COMPARING GROWTH PATTERNS AMONG ECOTYPES OF RESTORED SPARTINA ALTERNIFLORA

Genetically diverse stands of habitat-forming species can have high productivity and recover from disturbances. Salt marsh restoration typically utilizes local grasses, which are usually clonal and therefore have relatively low genetic diversity. Creating a marsh with multiple ecotypes should

increase genetic diversity, which may correlate with increased productivity. To understand the benefits of increased genetic diversity within a single plant species, we performed a common garden experiment in a constructed salt marsh to compare post-transplant growth patterns among *Spartina alterniflora* ecotypes. Plants from three coastal Texas locations at least 60 km away from the common garden were transplanted in July 2011. Transplanted sprig survival, vegetative growth, and inflorescence production were compared among ecotypes. Data were analyzed based on an initial growing period and a winter growth period. Three months after transplantation, survivorship was significantly different among ecotypes; 10% of Port O'Connor's ecotype remained alive; other populations had less than 7% survival. Throughout the initial growing period, 56 Port O'Connor sprigs generated shoots; 60% more than Bolivar's ecotype. By October, surviving Bolivar plants produced 2.2 inflorescences per transplant compared to 1.5 (Texas Point) and 1.0 (Port O'Connor). After winter growth, Port O'Connor produced an additional 210 shoots compared to 155 (Bolivar) and 99 (Texas Point). Each ecotype displayed different strengths in terms of survivorship, growth patterns, and reproduction. In restoration, including different ecotypes with various strengths can contribute aspects that complement each other, possibly creating a more productive marsh than if a single ecotype had been used.

BIANCA LOPEZ

Curriculum for the Environment and Ecology, University of North Carolina, Chapel Hill, NC, USA
Ph.D., 2nd year

EFFECTS OF INCREASED TEMPERATURE AND DROUGHT ON URBAN RIPARIAN PLANT COMMUNITIES

Remnants of natural vegetation in urban environments not only tend to be small and isolated, but also experience altered environmental conditions as a result of urbanization. Two of these conditions, the Urban Heat Island (UHI) effect and the Urban Stream Syndrome (USS) may be stressful for plants and limit the species that persist or thrive in urban systems. The UHI is a phenomenon of warmer temperatures in more developed areas, and the USS describes symptoms of urban streams that result from large volumes of water entering streams from parking lots and pipes, including bank incision and water table lowering. These conditions may cause selection for plants with adaptations to hot and dry conditions in riparian areas. I examined the effects of these two phenomena on urban riparian forest communities in the Research Triangle area of North Carolina. I sampled sites of remnant riparian forest within this landscape, stratified by temperature and the amount of development in the surrounding area. I then used NMS ordination to observe differences in community composition between sites and how they relate to UHI and USS gradients. I also quantified trends in community composition in terms of relative abundance of certain groups of species that I expected to be more adapted to warm temperature and drought conditions, including C4 plants, species with southerly ranges, upland species, and those with traits that enhance drought-tolerance.

CYNTHIA MALONE

University of Wisconsin-Madison, Madison, Wisconsin
Undergraduate, 4th year

ORANGUTAN DENSITY AND NESTING PREFERENCE IN CENTRAL KALIMANTAN, INDONESIAN BORNEO

The extinction of orangutans has been predicted to occur by 2025 without a reversal of the

extensive deforestation of Indonesia's rainforests. Conservation efforts have begun to focus on measuring orangutan population densities and responses to change so that remaining habitat is adequately protected. Population densities are estimated using indirect surveys of orangutan nests, but our knowledge of nest construction is limited. I conducted a six-week study of orangutan density and nesting preferences with the 'Orang-utan Tropical Peatland Research Project' (OuTrop). OuTrop is based in the Sabangau peat-swamp forest, home to the largest remaining population of orangutans in the world, *Pongo pygmaeus wurmbii*. Two sites of different disturbance levels, one a protected relic primary forest and the other a heavily degraded and fragmented forest, were compared in order to enhance our knowledge of how this subspecies copes with disturbance. In the degraded forest, density estimates were nearly twice that of those of the protected forest, potentially indicative of an over-crowding of individuals as the population is pushed into a smaller habitat patch fragmented by forest fires. Analysis of the environmental components of nest construction revealed preferences for particular tree species, which has been demonstrated previously in the protected forest, and a significant relationship between tree height and tree-tying, the use of multiple trees to build one nest. These preliminary results warrant further assessment of the degraded forest ecosystem and potential fire effects to better ascertain whether this population can persist without effective management.

SUMMER MARTIN

Scripps Institution of Oceanography, La Jolla, California, USA
Ph.D., 4th year

Coauthor:

Lisa Ballance, Protected Resources Division; Southwest Fisheries Science Center; NOAA Fisheries, La Jolla, California, USA

YELLOWFIN TUNA AS AN INDICATOR OF ECOSYSTEM STATE IN THE EASTERN TROPICAL PACIFIC

Biodiversity is believed to be positively correlated with ecosystem resilience. Because biodiversity data can be challenging to collect, biodiversity indicators are valuable predictors of ecosystem state. This is particularly true for oceanic ecosystems. We explore the potential for using yellowfin tuna (*Thunnus albacares*) as an indicator of biodiversity by linking ecological characteristics of tuna (e. g. distribution and abundance) to diversity indices calculated from an existing dataset. These data were collected from NOAA Fisheries ships at sea during 10 years over a 19-year time span (1988-2006) in the oceanic eastern tropical Pacific, an area of 21 million km² that includes waters of 12 nations and the oceanic commons. We characterize diversity of cetaceans, seabirds, larval fishes, and flyingfishes and relate these to yellowfin tuna metrics. Because of the close ecological association of these tuna with dolphins in this region, our results have particular relevance to depleted populations of spotted and spinner dolphins (*Stenella attenuata* and *S. longirostris*, respectively), but more broadly, to ecosystem-based management of oceanic systems. These ecosystems present a complex set of management challenges. The living marine resources they include are often transboundary; enforcement of international agreements is difficult; and the ecosystem goods and services they provide are global. Yellowfin tuna is a commercially important species and tuna information is widely available through fisheries datasets, providing the potential to predict ecosystem state for this system into the future.

PATRICK MCLAUGHLIN

Drexel University, Philadelphia, Pennsylvania, USA

Ph.D., 3rd year

Coauthor:

Gail Hearn, Drexel University, Philadelphia, Pennsylvania, USA

AFRICAN AMPHIBIAN HOTSPOT: DISCOVERY AND CONSERVATION OF NEW SPECIES ON BIKO ISLAND

In comparison to species in North and South America and Southeast Asia, African amphibian species are poorly studied. Biodiversity hotspots known to harbor high diversity include regions of West Africa in the Guinean Forests and Cameroon Volcanic Line. Bioko Island lies 32 km off the coast of Cameroon, separated from these regions of intense biodiversity for 12,000 years. Bioko's pristine tropical forests, high annual rainfall, and varied topography provides ideal amphibian habitat. Past estimates of high amphibian diversity on Bioko have proven to hold true, as suggested by the results of this comprehensive 3-year inventory. The goals of this ongoing study are: collect and catalog species across the island, identify landscape features that may contribute to gradients in species richness, sample for the deadly amphibian disease chytridiomycosis, and identify potential threats to vital habitat and populations. Results thus far have revealed 4+ new species, the presence of two endangered species thought to be restricted to the mainland, and an overall diversity that includes over 35 species across 8 different families. Results also confirm chytridiomycosis is present despite no apparent mass die-offs, suggesting resistance in Bioko species. Future genetic analysis of at-risk populations, combined with known threats, will enable a full assessment of Bioko's most threatened species and development of specific conservation action plans. This study has revealed that Bioko harbors many rare and endangered species from the mainland, along with a host of its own endemics, making it something of an amphibian ark for conservation in West Africa.

ANAHI NARANJO

Mianus River Gorge Preserve, Bedford, NY, USA and The High School for Environmental Studies, New York, NY, USA

Coauthor:

Jason Bonet, Mianus River Gorge Preserve, Bedford, NY, USA and The High School for Environmental Studies, New York, NY, USA

COYOTES IN NEW YORK CITY? FUHGEDDABOUTIT!

In 2011, camera trap arrays were placed in 14 parks across the 5 boroughs of New York City to document the distribution of coyote (*Canis latrans*). Cameras were placed in each park at a minimum density of 1 camera every 0.25km² and parks were monitored for at least 6 weeks each from March to October. Coyotes were detected in most of the parks in the Bronx (5 out of 6 parks) but only in one park on Long Island. Family groups were detected in Pelham Bay Park, the largest park in the study. Coyotes have colonized the majority of suitable sites in the Bronx but successful dispersal to non-mainland sites in Queens and Brooklyn seems limited. However, we expect that coyotes will colonize sites in Queens, Brooklyn, and possibly Manhattan in the near future and managers should prepare for these events. This is the first large-scale camera trapping survey and the first study of any kind to focus on coyotes in NYC. We plan to continue monitoring parks in Queens, Brooklyn, and Manhattan to locate any new colonization/dispersal events and develop predictive models that will assist managers in determining how coyotes move through the urban matrix and what sites will likely be colonized.

ILONA NAUJOKAITIS-LEWIS

University of Toronto, Toronto, Ontario, Canada

Ph.D., 3rd year

Coauthors:

Janelle Curtis, Dept of Fisheries and Oceans, Nainamo, BC, Canada

Debbie Badzinski, Bird Studies Canada, Ottawa, Ontario, Canada

Marie-Josée Fortin, University of Toronto, Toronto, Ontario, Canada

IMPACT OF DYNAMIC THREATS AND UNCERTAINTIES ON SPECIES VIABILITY AT THE RANGE MARGIN

Species ranges are dynamic due to disturbances and global environmental changes. Although climate change is expected to lead to range expansions for many species, habitat loss and fragmentation may function as barriers leading to lowered colonization success and species persistence in these regions. While current approaches to evaluate the influence of global changes on species distributions typically integrate temporally dynamic climate variables, patterns of available habitat and population-level processes that influence extinction risk are often considered static, if at all. We link a metapopulation model with species distribution models to investigate potential changes in range dynamics at the margin with climate changes, and use simulated landscapes with varying amounts and configurations of suitable habitat, and dynamic changes in suitable habitat over time to quantify relative extinction risk for the Hooded Warbler. We show that managing for suitable habitats presents a viable option for securing persistent populations, however, even under increasingly favourable climatic conditions, limited suitable habitat leads to declines in predicted extinction risks and variability in the location of the range margins. This work underscores the importance of using process-oriented modeling approaches that capture population dynamics at the species' range margin and the importance of managing for non-climatic related threats.

NATALIA OCAMPO-PENUELA

Duke University, Durham, NC, United States of America

Ph.D., 1st year

THE HOTTEST SPOT FOR BIRD CONSERVATION IN COLOMBIA

Colombia has 1819 bird species (SACC 2012), with 72 endemic species and a 10% of its birds threatened. In order to find the area where conservation would be more effective in protecting endemic and small range bird species, we mapped the concentration of these bird species in Colombia. I used the species' ranges produced by BirdLife International (2012) and then refined by elevation and suitable habitat to obtain a more realistic range. My methods overlaid the ranges of 172 bird species to find the areas with largest concentrations of endemic and small range species; as well as the concentration of range loss due to habitat destruction or transformation. The Western Andes appeared as the area with largest concentration of endemic and small range species with a maximum of 36 species. When evaluating the loss of range, the Eastern slope of the Western Andes, near Cali (Colombia's second largest city) proved to be the hottest of the spots with around 35 endemic and small range species presence topped with the same number of species having lost range due to habitat loss. Local conservation actions will take place after field assessment of the area to choose the most priority habitat patches.

ELSA ORDWAY

Columbia University, New York, New York, United States
Master's, 1st year

A SPATIAL ANALYSIS OF CIVIL WAR AND FOREST COVER CHANGE IN RWANDA

This study examines how conflict events and conflict-induced settlement impact forest cover change, with direct consideration of protected areas in Rwanda and the eastern Democratic Republic of the Congo (DRC). Alterations of land cover continue to be a dominant cause of environmental change in the tropics, with a large focus of land use and land cover change research aimed at examining the complex causes, consequences, and rates of deforestation. Conflict can drive deforestation through rapid, rural migration and human demographic shifts, altering land use patterns, and modifying land and forest cover. However, the relationship between deforestation, conflict and rapid human movement, proximate to protected areas, has not been extensively studied. With increasing human migration, there is a need to better understand the extent to which conflict and rapid migration influence human and ecosystem vulnerability in the face of environmental change. Rwanda experienced massive population displacement as a result of the recent civil war and genocide (1990-1994). To understand the ecological reverberations of this conflict, this study examines how human pressure and biophysical factors interact to affect forest cover and land cover. A multi-scale, spatiotemporal analysis was conducted using remotely sensed Landsat TM (1986-2011) and MODIS (2000-2011) imagery to detect changes and patterns in forest cover in Rwanda and the eastern DRC related to the civil war, post-conflict policy, resettlement and protected area conservation. Regression analyses are used to explore relationships between deforestation, conflict event data, settlement data and biophysical factors.

FRANCIS OSEI-GYAN

Kwame Nkrumah University of Science and Technology, Kumasi, Ashanti, Ghana
Master's, 2nd year

Coauthor:

Caleb, Ofori-Boateng, Forestry Research Institute of Ghana, Kumasi, Ashanti, Ghana

HABITAT CHARACTERISTICS AND AMPHIBIAN CONSERVATION

The West African forest faces severe threat from fragmentation and degradation that impacts negatively on amphibian distribution. We investigated the influence of landscape and habitat characteristics on the distribution rates of three leaf litter frogs (*Phrynobatrachus ghanensis*, *P. latifrons* and *P. tokba*) in Ghana. To determine the set of habitat variables that best predicts the distribution rates of the target species, we developed 18 candidate models using species presence and absence data as well as landscape and habitat characteristics. We found species-specific responses to the habitat characteristics examined. The distribution rates of *P. ghanensis* and *P. latifrons* were predictable by patch size and availability of breeding habitat whilst the distribution of *P. tokba* was determined by variation in forest types. When focusing on model selection analysis, *P. ghanensis* showed strong specialized habitat requirement whereas both, *P. latifrons* and *P. tokba* exhibited tendencies towards a more generalized habitat preferences. Our results in general demonstrate the importance of species autecological data in conservation

planning. We recommend that recourse to generalized principles that have not been tested at a local scale for species conservation rather than on sound ecological data must be avoided.

SUZANNE PIERRE

New York University, New York, NY, USA
Undergraduate, 3rd year

HUMAN IMPACTS ON SPECIES DIVERSITY AND VEGETAL COVER OF SEAGRASS IN MADAGASCAR

Seagrass communities on Madagascar's southwest coast are pressured by increasing human dependence on coastal resources for livelihoods. The nine species of seagrasses in this region support diverse ecosystems and recruitment for many vertebrate and invertebrate species. This point study looks to determine the different levels of percent cover and species diversity of seagrass beds at highly disturbed and less disturbed areas at intertidal meadows near coastal village sites. These villages, Ifaty and Mangily, are dominated by fishing livelihood activities and touristic activities, respectively. I predict that at both sites, species with high turbidity tolerance will be more abundant in moderately disturbed areas and percent cover will be negatively correlated with proximity to the village. To test this hypothesis, I will lay three 50 meter transects at different depths for the highly disturbed and less disturbed areas at each site. Each transect will have 12 quadrats for which I will quantify percent cover and species abundance. Highly disturbed and less disturbed classifications will be determined based on satellite imaging of the overall density of near-shore seagrass along the coast. This study will also produce a spatial analysis of the data using GIS software to represent the aforementioned parameters at each area in relation to human settlements and other establishments along the coast. Through this research, I hope to improve the understanding of the relationship between species presence, seagrass diversity and types of human activities. This study will be supported by the advisement and material contributions of the Reef Doctor NGO.

T E ANGELA QUIROS

University of California Santa Cruz, CA, USA
Ph.D., 4th year

LINKING TERRESTRIAL AND MARINE CONSERVATION AT THE COASTAL INTERFACE

Marine and terrestrial protected areas have historically not been linked. This study examines the utility of collocating marine and terrestrial areas in small islands in the Philippines, using seagrass ecosystems as indicators of nearshore marine health. Seagrass beds in seventeen islands were surveyed in 2010 and 2011, containing protected nearshore marine areas and unprotected nearshore marine areas. Each island either had a protected terrestrial area or an unprotected terrestrial area. Preliminary results show that seagrass ecosystem health, as measured by abundance parameters such as % cover were significantly greater in areas with marine or terrestrial protection. In addition, nutrient analysis of seagrass tissue samples in areas with both terrestrial and marine protection showed lower nutrient (%N) levels than other areas. Analysis of the fish and invertebrate community in the seagrass beds is also underway.

BRENDAN REID

University of Wisconsin-Madison, Madison, WI, USA
Master's, 2nd year

Coauthors:

Elizabeth Alter, City University of New York/York College, Jamaica, NY, USA

George Amato, American Museum of Natural History, New York, NY, USA

Karen A. Bjorndal, University of Florida, Gainesville, FL, USA

Alan B. Bolten, University of Florida, Gainesville, FL, USA

Meredith Martin, Yale University, New Haven, CT, USA

Joseph Nairn, University of Georgia, Athens, GA, USA

Brian Shamblyn, University of Georgia, Athens, GA, USA

Oscar Pineda-Catalan, Cold Spring Harbor Laboratory, Cold Spring Harbor, NY, USA

Eugenia Naro-Maciel, City University of New York/College of Staten Island, Staten Island, NY, USA

PHYLOGEOGRAPHY OF ATLANTIC GREEN TURTLES: INSIGHTS FROM MULTIPLE GENETIC MARKERS

To investigate phylogeographic patterns in green sea turtles (*Chelonia mydas*), fifteen nuclear microsatellite loci were genotyped from six nesting ($n = 301$) sites in the Western Atlantic and analyzed with respect to new ($n = 32$) and published ($n = 1,177$) mitochondrial data. Bayesian analyses of microsatellite results revealed two clusters in the Western Atlantic, with southern rookeries Trindade Island and Rocas Atoll, Brazil forming one cluster, and northern rookeries Florida (USA), Tortuguero (Costa Rica), Galibi (Suriname), and Aves Island (Venezuela) forming a second cluster. Even so, substantial migration between clusters was evident at these nuclear loci. Comparison of mitochondrial data from males sampled during the breeding season at Rocas Atoll ($n = 32$) to previously published nesting females uncovered no significant differentiation. In combination with tagging data this supports the hypothesis of mixing during overlapping breeding migrations. Historical analysis of mitochondrial and microsatellite data revealed population expansions as well as contractions. The spatial distribution of observed microsatellite clusters and mitochondrial lineages is consistent with historical expansion out of two glacial refugia followed by mixing around central rookeries. This study provides a more complete historical context and refined understanding of population structure, thus enhancing conservation and recovery efforts for this globally endangered species.

DANIELLE RIVERA

The City College of New York, New York, New York, United States
Undergraduate, 4th year

Coauthor:

Ana Carnaval, The City College of New York, New York, New York, United States

GENETIC DIVERSITY OF MABUYA DORSIVITTATA OF THE BRAZILIAN ATLANTIC RAINFOREST

Tropical montane species of the Brazilian Atlantic rainforest are known to be under serious anthropogenic threat. This study aimed to examine the distribution patterns, genetic relatedness of multiple populations, and implications of future habitat loss due to global warming for one species of Mabuya lizards. Specifically, we focused on the species *Mabuya dorsivittata* (Squamata: Scincidae): South American skinks distributed throughout southeastern Brazil. A

maximum likelihood method was utilized for the purpose of phylogenetic reconstruction and phylogeographic analyses based on nuclear and mitochondrial DNA extracted from different populations of this species. Fragments from the mitochondrial cytochrome b (cytb) gene as well as those of the nuclear genes *sincaip*, *rpl35*, and the proto-oncogene *c-mos* were analyzed. The data indicated one misidentified sample and high levels of genetic structure within what is currently recognized as *Mabuya dorsivittata*. Species distribution models under past climate indicated that this species was relatively unaffected by LGM fragmentation, unlike lowland and mid-altitude endemics of the Atlantic rainforest. It can be hypothesized that a geological divide promoted divergence between the species populations that are geographically separated along the coastal forest. Similar divergence patterns are observed in several other montane species in southeastern Brazil. The data are presented and discussed in the light of future distribution climate models. Based on the known genetic structure and the expected availability of habitats for this species, I discuss conservation priorities for this endemic skink.

BARBARA RIZZO

The City College of New York, New York, NY
Undergraduate, 4th year

Coauthor:

Ana Carnaval, The City College of New York, New York, NY

MODELING THE CLIMATIC ENVELOPE OF AN AMPHIBIAN FUNGUS IN THE BRAZILIAN COASTAL FOREST

Significant global amphibian declines have been linked to the emerging infectious disease chytridiomycosis and its causative fungal agent, *Batrachochytrium dendrobatidis*. Conservation of anurans is imperative; they are fundamental to thriving ecosystems and biodiversity, and can also be used as indices of environmental change. I extracted DNA from 188 swabs of frog skins from ten localities in northeastern Brazil and across twenty-one genera of anurans. I performed real-time PCR to determine presence of fungal DNA in the swabs. Fall 2011 research used these qPCR results, twenty climatic variables and Maximum Entropy algorithms to model fungal distribution in Brazil during current and future times. I found that 12 individuals were infected, 11 being from the Hylidae family. Additionally, I test whether susceptibility to the chytrid fungus is phylogenetically constrained, and whether it is associated with breeding habitats. Maximum entropy models for current climate conditions pinpoint areas in the southern, central and northern forests where the fungus may occur. They also indicate that montane coastal forests of São Paulo and Rio de Janeiro may be areas of concern for high probability of chytrid presence. Previous studies in other parts of the world are consistent with these data, and indicate that moister and cooler regions may be at higher risk of chytrid-driven population declines. When the bioclimatic envelope of the fungus is projected given different scenarios of global warming, within seventy years from now, the probability of chytrid occurrence is predicted to decrease in the central forests, including states of Minas Gerais and Bahia.

EVARISTE RUTEBUKA

National University of Rwanda, Southern, Rwanda
Undergraduate completed 2012

Coauthors:

Donat Nsabimana, National university of Rwanda, Southern, Rwanda
Nicole Gross-Camp, University of East Anglia, Norwich, United Kingdom.

RECONCILING BIODIVERSITY AND DEVELOPMENT THROUGH DIRECT PAYMENTS FOR CONSERVATION EVALUATION OF COMMUNITY BASED CONSERVATION AROUND PROTECTED AREAS OF RWANDA.

The loss of wildlife and its habitats, and conflicting relations between Protected Areas management and neighboring communities continue to challenge conservation efforts and threaten the survival of Rwanda's protected areas; however there is no consensus on the success of Community Based Conservation (CBC) approaches in Rwanda and in many other African countries. This study was conducted around Nyungwe National Park (NNP) in June 2011 and evaluated the impact of bee keeping cooperative called Cooperative des Apiculteurs du Secteur Kitabi (COASEKI) on conservation awareness change of NNP during 2.5 years of its operation using 210 household interviews. The results of attitudes showed that the population has undergone great positive change. The people who benefit from the cooperative are more positively changed than the people who do not. The crop raiding conflict is decreasing greatly in Shaba cell where the payment for Environmental Service Scheme (PES) is practiced while others cells do not. The effect of the different activities cannot be separated and any measured impact cannot only be attributed to the COASEKI as a whole because there is also the PES project implemented in the same area. It is suggested that CBC can contribute positively to the situations, but not as a panacea for the problems of the park and can reduce conflicts of interest between communities and park management at good extent. Keywords: Community based conservation, Attitude, Behavior, Knowledge, Nyungwe National Park, Protected areas, COASEKI.

LESLIE RUYLE

University of Georgia, Odum School of Ecology, Athens, GA, USA
Ph.D., 4th year

Coauthors:

Brian Todd, University of Georgia, Athens, GA, USA

John Maerz, University of California- Davis, Davis, CA, USA

COMPARATIVE DEMOGRAPHICS AND ANTHROPOGENIC IMPACTS ON AN ENDANGERED SPECIES

Endangered species living in protected areas with humans pose a different set of conservation challenges. Life history characteristics may be influenced by human activities. We estimated the influence of human activities on traits important for population growth rates and persistence in the environment. Our focal species is *Ctenosaura melanosterna*, a critically endangered lizard living on a protected archipelago of Honduras. We used a three-year study to describe effects of human perturbation on their ecology. We chose four sites, two with high and two with low human impacts, to detect differences in population structure and life history of this lizard. Our results show differences in both individual behavior and population characteristics for each site in response to levels of human presence. Specifically, we found that ctenosaur and human density positively covaried with high resource subsidies and low molestation rates. However, ctenosaur density negatively covaried with human density at the site with high interference by dogs and people. Site had an effect on ctenosaurs with high human molestation, despite receiving supplemental food and water, resulting in shorter SVLs and lower masses. Our results show the single most important variable influencing ctenosaur population densities, sizes, and behavior is

level of human molestation. It is important for wildlife managers to recognize that human density itself is not detrimental to *C. melanosterna* populations, but rather the key factor is type of human disturbance. These data are critical for understanding how to best create management plans for this endangered species in a human inhabited archipelago setting.

NIKKI SPRINGER

Yale School of Forestry and Environmental Studies, New Haven, CT, USA
Ph.D., 1st year

WILD ENERGY: ENERGY GENERATION IN WILDERNESS LANDS

Given the increasing demand for domestic energy, and the land-intensive nature of many types of non-renewable energy sources, it is not surprising that the National Parks Wilderness Areas are already experiencing the pressure and conflict between conservation and energy generation. Yet without a consistent framework for evaluation, the NPS runs the risk of both inconsistent implementation of core values and failing to view their cumulative portfolio in sum rather than on a nuanced case-by-case basis. Through collaborations with regional and national level leaders of the NPS, this work develops a set of strategic decision parameters to evaluate and compare proposed renewable energy infrastructure projects in or directly adjacent to nationally-designated Wilderness Areas. Building off of intense analysis of several case studies detailing solar, wind, and hydroelectric projects in different stages of completion, evaluation metrics incorporate the competing environmental, economic, and cultural demands of developing utility-scale renewable energy infrastructure. This work involves an analysis of the current state of NPS strategy, interviews and feedback from decision-makers and stake-holders at all levels, and a summary of current, decommissioned, and proposed infrastructure projects. It provides a revised and comprehensive framework for project evaluation and a guide for strategy implementation. Though focused on public lands, this methodology is directly applicable to the management of any large, diverse portfolio of land with competing needs and multiple stakeholders and provides a real-world model of reconciling the fundamental conflict of conservation and energy generation. Keywords: conservation, renewable-energy infrastructure, environmental impact, cost-benefit analysis, strategic decision-making, portfolio management

JESSICA STANTON

SUNY Stony Brook, Stony Brook, NY USA
Ph.D., 4th year

HOW COMMON SPECIES GO EXTINCT: THE STORY OF THE PASSENGER PIGEON

Once the most abundant bird species in North America, the passenger pigeon (*Ectopistes migratorius*) was so numerous many observers did not believe they could ever be at risk of extinction. Over-harvest and habitat loss have each been proposed as the primary factor leading to the extinction of the passenger pigeon. I developed a temporally dynamic and spatially explicit modeling framework incorporating multiple lines of historical and biological evidence in order to quantitatively explore the likelihood of different extinction scenarios involving habitat loss and harvest. Although the precise conditions which led to the extinction of this species can never be known conclusively, the results of the model imply that the combination of both habitat loss and harvest led to the precipitous decline. The results suggest that direct mortality from harvest alone was unlikely to have accounted for the observed rate of decline. However, a sensitivity analysis conducted on the population model parameters suggests that the species may have been

especially vulnerable to the method of harvesting as it reduced reproductive success. Meanwhile, the timeline of available habitat illustrates the decreasing availability and increasing fragmentation of suitable nesting sites for large colonies. IUCN Red List criteria applied as if naive to the ultimate fate of the species shows how rapidly the species moved through the risk categories. This study illustrates the importance of conducting risk assessment early and often even for seemingly abundant and common species, particularly when impacted by commercial harvest or rapid changes in land use or land cover.

KIMBERLY STEPHENSON

University of the West Indies, Mona Campus, Kingston, Jamaica
Master's, 3rd year

Coauthors:

Byron Wilson, University of the West Indies, Mona Campus, Kingston, Jamaica
Michael Taylor, University of the West Indies, Mona Campus, Kingston, Jamaica
Tannecia Stephenson, University of the West Indies, Mona Campus, Kingston, Jamaica

THE IMPACTS OF CLIMATE CHANGE ON A DRY FOREST FAUNA

One impact of shifts in global climate has been a shift in the populations of living organisms and the areas they inhabit. The insular Caribbean is far from immune to these impacts and extinction is rising as a very real risk to the region's endemic species. Bioclimatic modelling has only been done minimally for the Caribbean region, though it is a biodiversity hotspot. Also, the size of the islands constituting the region makes ecological datasets difficult to accurately represent with many modelling techniques. The Hellshire Hills ecosystem in Jamaica in particular is one of the best preserved dry forests in the region and home to a number of endemic species. This research project aims to map and project the climate of the area, and to develop a model to project future abundance of arthropods and anoline lizards in the Hellshire Hills, based on the current influence of rainfall, temperature and relative humidity on their populations. Preliminary findings show strong influence of seasonal rainfall and temperature on abundance, particularly the late rainy season (ASON). Findings also show that predictive equations can be built using climate and interspecies relationships for even a small population that can explain most of the variance in that population. The ultimate goal of the overall project is to identify the vulnerability of the study site to the effects of the shifting climate of the island and, by extension, its conservation needs.

KELLY STONER

Yale School of Forestry & Environmental Studies New Haven, CT, US and Botswana Predator Conservation Trust, Maun, Botswana
Master's, 1st year

Coauthors:

Lesley McNutt, Botswana Predator Conservation Trust, Maun, Botswana
Olefile Sebogiso, Botswana Predator Conservation Trust, Maun, Botswana

CHANGES IN PASTORALIST ATTITUDES TOWARD LARGE CARNIVORES IN BOTSWANA'S OKAVANGO DELTA

Large carnivores are in decline due in large part to conflict with humans over livestock. Human-carnivore conflict is a particular concern in Botswana's Okavango Delta, which is home to globally

important populations of lions (*Panthera leo*), leopards (*Panthera pardus*), spotted hyenas (*Crocuta crocuta*) and endangered African wild dogs (*Lycaon pictus*). Attitudes are often used as a metric to gauge the effectiveness of programs designed to alleviate conflict, but few studies actually measure these impacts over time. To assess Botswana's compensation program and other environmental policies we surveyed residents of a pastoral community in 1995 and duplicated the survey in 2012. Data are still being collected, but initial analyses indicate statistically significant changes in attitudes. Overall attitudes toward wildlife became more positive during that time and statements such as "National parks and reserves are a waste of land" received stronger negative reactions in 2012 than in 1995, indicating greater support for protected areas and wildlife conservation. However, statements such as "It would be okay to have some cattle areas changed into wildlife areas if we got wildlife related jobs" received stronger negative reactions in 2012 than in 1995. Thus it seems that while livestock owners readily acknowledge the value of wildlife, they are less willing to tolerate personal costs for the presence of wildlife. This study emphasizes the value of assessing attitudes prior to the launch of new programs or policies and monitoring changes over time, as this knowledge can help shape the development and management of such programs.

KINGA STRYSZOWSKA

Department of Environmental Science and Engineering, Clarkson University, Potsdam, NY, USA
Ph.D., 1st year

Coauthors:

Tom Langen, Departments of Biology & Psychology, Clarkson University, Potsdam, NY, USA
Michael Twiss, Department of Biology, Clarkson University, Potsdam, NY, USA

USING BIODIVERSITY INDICATORS TO EVALUATE WETLAND QUALITY IN MASSENA, NY

The natural wetlands along the St. Lawrence River in New York have been impacted by major habitat alteration and contamination that occurred as a consequence of the St. Lawrence Seaway Project and historical industrial development. For this reason, the sector of the St. Lawrence River near Massena New York is one of six currently-listed environmental Areas of Concern (AOC) in New York State. In recent years, various environmental restoration and remediation projects have been implemented in the area; however, there is a recognized information gap as to whether these environmental mitigation projects have been successful in restoring the beneficial use impairments (BUIs) identified for the AOC. We have been funded by the St. Lawrence River Research and Education Fund (SLRREF) to conduct a marsh monitoring project that will assess the ecological quality and ecosystem services of wetlands in the Massena AOC. The objective of our proposed study is to evaluate the current state of one listed BUI (Loss of fish and wildlife habitat) and one potential BUI (Degradation of fish and wildlife populations) by surveying biological indicators of wetland quality (birds, reptiles, amphibians, fish, plants) and water quality (e. g. oxygen, nutrients, turbidity, phytoplankton) within a representative sample of wetlands in the Massena AOC and a comparable set of reference wetlands form outside the AOC. Our study will measure the degree of wetland impairment and environmental degradation and the effectiveness of wetland restoration & mitigation projects at replicating un-impacted wetlands. This research has direct implications for wetland management and restoration.

THILINA SURASINGHE

School of School of Agricultural, Forest, and Environmental Sciences, Clemson University,
Clemson, South Carolina, USA
Ph.D., 4th year

Coauthors:

Robert Baldwin, School of Agricultural, Forest, and Environmental Sciences, Clemson University,
Clemson, South Carolina, USA

Zac Reinstein, School of Agricultural, Forest, and Environmental Sciences, Clemson University,
Clemson, South Carolina, USA

THE COMMUNITY COMPOSITION OF STREAM SALAMANDERS AS A FUNCTION OF RIPARAIN LAND-USE

Thirty-two percent of amphibians are globally threatened and 50% suffer population declines. Habitat loss, a condition prevalent in amphibian hotspot is the key factor responsible for this predicament. The southeastern-US is rich in salamander diversity and endemism and is an evolutionary center for Plethodontid (lungless) salamanders. We surveyed low-order streams of Blue-Ridge and Piedmont of Southeastern-US representing four riparian land-use types (forested, agricultural, residential, urban) to determine the responses of salamanders to riparian land-uses. We performed NMDS ordinations to identify species assemblages occurring in different stream types. In Blue-Ridge, *Eurycea wilderae*, *E. cirrigera*, *Desmognathus marmoratus*, *D. quadramaculatus*, *D. ocoee*, *D. monticola*, *Pesudotriton montanus*, and *P. ruber* associated forested streams. Streams with agricultural and residential riparian land-uses were mostly occupied by *D. fuscus* and *E. gluttolineata*. In Piedmont streams, *P. montanus* and *P. ruber* showed close association with forested streams. Other Plethodontids did not show specificity in preference among riparian land-uses. A one-way ANOVA revealed that adult ($F=18.13$, $p<0.05$) and larval ($F=11.96$, $p<0.05$) species richness of Plethodontids differed significantly among four riparian land-use types in the Blue-Ridge. An LS means contrast revealed that adult species richness was significantly high in forested streams in comparison to any other stream types in the Blue-Ridge ($t=6.16$, $p<0.05$). However, the larval species richness did not differ significantly among four riparian land-uses in the Blue-Ridge ($t=1.08$, $p>0.05$). The LS means contrast also showed no significant differences in species richness among the four riparian land-uses in the Piedmont for adults ($t=1.59$, $p>0.05$) or larvae ($t=1.07$, $p>0.05$).

SCOTT SVEIVEN

State University of New York - College of Environmental Science & Forestry & National Park Service-Rocky Mountain I&M Network, Syracuse, NY, USA
Master's, 2nd year

PLANT INVASIONS: TESTING THEORY WITH ECOLOGICAL MONITORING DATA FROM WETLANDS IN COLORADO, USA

Invasive species are currently impacting landscapes worldwide. The role of these invasions in specific community types and factors influencing invasibility is not well understood. Continued changes in climatic variables are predicted globally and may exacerbate the effects of invasive species in some regions and community types by introducing or facilitating disturbance. Wetlands are one of the most functionally critical components of landscapes globally, but their responses to disturbances like altered hydrology from climate change, herbivore pressure, and human

disturbance are not clear. Using a robust dataset from 420 vegetation monitoring plots (10x10m), species composition, disturbance metrics, and physiochemical properties collected in collaboration with the the National Park Service's Rocky Mountain Inventory and Monitoring network will be used to assess differences in invasive species abundance and composition within and between fens, wet meadows, and riparian wetlands across National Park units in Colorado. Variable probability distributions of species composition, abundance, hydrology, herbivory, and human disturbance within and between wetland types will be analyzed using ordination techniques including PCA, DCA, and NMS to construct a model or suite of models describing how invasive species vary according hydrologic setting, herbivory, and human disturbance. Statistical treatments will attempt to parameterize and predict invasibility in wetlands. Improved understanding of invasives in wetlands is necessary to optimize conservation and natural resource planning, and policy development. Outcomes from this research will be utilized by NPS staff to inform and improve management strategies of wetland systems in park units and to direct further invasive and wetland research.

MICHAEL TREGLIA

Department of Wildlife and Fisheries Sciences, Applied Biodiversity Science Doctoral Program,
Texas A&M University, College Station, TX, USA
Ph.D., 2nd year

Coauthor:

Adam C. Landon, Department of Recreation, Parks, and Tourism Sciences, Applied Biodiversity
Science Doctoral Program, Texas A&M University, College Station, TX, USA

INTEGRATIVE RESEARCH FOR BIODIVERSITY CONSERVATION AND WATER RESOURCE MANAGEMENT

As species and ecosystems face a variety of threats worldwide, it is critical to approach biodiversity conservation in an interdisciplinary context. We are presenting an integrative approach to research the coupled social and ecological systems of southern California, with a dual goal of conserving local species and improving management of water resources. This region is home to a number of unique plants and animals, and has scarce supplies of surface water. However, myriad factors pose risks to these resources. In particular, the region has experienced major land cover changes in recent decades, with decreased chaparral and coastal sage-scrub, and increased urban area and grasslands. Previous research illustrates that, in general, there are direct and indirect linkages between land cover, hydrology, and biodiversity, though limited research has been done to relate these factors in southern California. We are using the endangered arroyo toad (*Anaxyrus californicus*), which is endemic to the region and sensitive to hydrologic regimes, as a focal species, with which to study relationships between land cover, hydrology, and local biodiversity. We are coupling this biophysical component of our work with social science research to better understand what factors drive land use practices here. An overall goal of our work is to find ways to improve regional land use practices in ways that benefit local ecosystems and water resources. We see this integrative research approach as a model that can be applied in other areas as well, to develop place-specific ways of creating healthier and more sustainable social-ecological systems.

CHRISTINE URBANOWICZ

University of North Carolina, Chapel Hill, North Carolina, USA
Ph.D., 3rd year

EFFECTS OF LANDSCAPE CONTEXT AND LOCAL FLORAL RESOURCES ON BEES VISITING SQUASH

There is increasing interest among food producers and scientists to understand how to conserve bees that pollinate crops. My research examines local and landscape-scale effects on the diversity and abundance of native bees visiting yellow squash and zucchini flowers in the piedmont of North Carolina. For both bee diversity and abundance, explanatory models were constructed using variables related to field-level floral resources, landscape composition, and landscape configuration. Bee diversity, measured as species richness, was positively correlated with the abundance of flowers in a field, negatively correlated with proportion of developed area around a field, and positively correlated with the contagion of wooded land. When comparing the separate models, the landscape configuration model fit the bee diversity data best, followed by the landscape composition then field-level models. Other factors, including field-level floral diversity, the proportion of wooded area around a field, and total field edge in the landscape around a field were not significantly related to bee diversity. The abundance of bees visiting zucchini, measured as visitation rate, was negatively correlated with the proportion of wooded land around a field, but no models could explain variation in visitation rate for yellow squash. This research demonstrates that efforts to conserve bee diversity need to consider the importance of land-management decisions made within a field and across a landscape.

ASSUMPTA UZAMUKUNDA

ReDirect Rwanda, National University of Rwanda, Biology Department, Huye, Southern province, Rwanda

Undergraduate completed

Coauthors:

Nicole Gross-Camp, University of East Anglia, Norwich, England

Brigitte Nyirambangutse, National University of Rwanda, Biology Department, Huye, Southern province, Rwanda

HOUSEHOLD USE OF FOREST RESOURCES AND LAND OWNERSHIP IN COMMUNITIES ADJACENT TO PARKS

This study quantified forest resources used by local peoples living near the Nyungwe National Park (NNP), Rwanda, in an effort to describe household use of forest resources as well as to explore the relationship between land ownership and household use of forest resources. We collected a series of 80 household questionnaires in two cells (the smallest administrative unit in Rwanda) adjacent to the NNP. Questions relating to forest resource use, land ownership, the distance from the household to the edge of NNP and self reported activities in the NNP were asked. Direct observations through household visits complemented the interpretation of interview data. Our study indicates that the majority of households still use forest resources (76%).

Bamboo was the most highly extracted resource from NNP (64%), followed by firewood (37%), timber (16%), medicinal plants (13%) and water (10%). None of those forest resources showed significant correlation with land ownership. The findings of our study challenges previous studies that found household use of natural resources increased with land ownership. We posit that land ownership alone cannot explain household reliance on forest resource and must include additional parameters like distance from the household to the resource, culture, economic value of the resource, assets at the household's disposal and law enforcement in the park. Key words: forest resources, land ownership, Nyungwe National Park (NNP), households.

JORDI VAN OORT

Wageningen University and Research Centre, Wageningen, Gelderland, The Netherlands
Master's, 2nd year

Coauthors:

Willem Fred de Boer, Wageningen University and Research Centre, Wageningen, Gelderland,
The Netherlands

Mike Peel, Agricultural Research Council, Nelspruit, Mpumalanga, South Africa

THE ELEPHANT EFFECT: HOW ELEPHANTS AFFECT HERBIVORE ASSEMBLAGES IN SOUTH AFRICA

Elephants can change the vegetation structure in savanna ecosystems, especially when elephant densities are high. Elephants can thereby affect the herbivore assemblages in the areas they utilise. However, uncertainty remains regarding the consequences of these effects. Some researchers state that elephants compete with other herbivores, while others believe that elephants facilitate them. This study focussed on the cascading effects of elephants on the ungulate browser and grazer community in savanna ecosystems in South Africa. This was done by analysing 16 years of continued vegetation and game census data from three reserves adjacent to the Kruger National Park. The research showed that browse availability at feeding heights below 2 m decreased in areas with high elephant densities. All reserves, even those where browse availability below 2 m did not decline, showed a proportional shift towards more grazers in the herbivore community in the presence of elephants. Moreover, the total biomass of small ungulate browsers declined in reserves where elephant densities were high whereas reserves with a low elephant density showed an increase in the total biomass of small ungulate browsers. The results indicate that an optimal elephant density appears to be valid for the lowveld area. Low elephant densities appear to benefit the small browsers in the herbivore community, whereas high elephant densities might lead to a megagrazer dominated herbivore community. Ultimately, an intermediate elephant density seems preferential for the herbivore community in the research area.

FRANCISCA VIDAL-GARCÍA

Posgrado del Instituto de Ecología AC. Xalapa, Veracruz, Mexico
Ph.D., 2nd year

Coauthor:

Juan Carlos Serio-Silva; Red Biología y Conservación de Vertebrados, Instituto de Ecología AC,
Xalapa, Veracruz, México.

PERCEPTIONS ABOUT MONKEYS IN SOUTHEASTERN MEXICO

The human perception about monkeys is the consequence of the kind of contact that people have with them in the areas where these animals inhabit. We have been working to understand the different local people opinions about species of Mexican monkeys (*Alouatta pigra*, *A. palliata* and *Ateles geoffroyi*). We have interviewed 470 people in 178 localities in the Southeastern Mexico. The interviews were based on 15 questions about personal knowledge concerning to biology and behavior, local uses, benefits obtained from them, and interest in primate conservation. At the moment, we have identified tendencies using descriptive statistics. We found 288 places with current presence, 124 places with past presence, and 58 places in which species have never

been present. Attitudes and uses depend on the places in which people are living and their ethnic origin. Negative opinions were more frequent in places in which people do not have contact with monkeys. However, knowledge and positive perceptions were more frequent in places in which people have, or had a daily contact with them. We have collected information about 19 traditional uses for monkeys; it includes nine recipes and four medicinal uses. People have identified 67 different plants which monkeys use in their feeding. These results represent a first approximation for identifying perceptions about monkeys and then, places in which efforts for conservation could be effective.

LISA WEBER

Yale School of Forestry and Environmental Studies, New Haven, Connecticut, United States
Master's, 1st year

Coauthors:

Shimon Anisfeld, Yale School of Forestry and Environmental Studies, New Haven, Connecticut, United States

Gaboury Benoit, Yale School of Forestry and Environmental Studies, New Haven, Connecticut, United States

REDUCING HYPOXIA LEVELS IN LONG ISLAND SOUND WITH CONNECTICUT CONSTRUCTED WETLANDS

I am examining how effective constructed wetlands can be when used as a best management practice to remove nitrogen from stormwater. Urban stormwater runoff carries large amounts of nitrogen and other pollutants from fertilized lawns, atmospheric deposition, and other sources. Wetlands may provide a valuable – but understudied – ecosystem service by removing nitrogen from this runoff. Two common nitrogen removal processes in constructed wetlands are plant uptake (ultimately leading to sequestration in wetland organic matter) and denitrification (loss of nitrogen as nitrogen gas). Wetlands are expected to be ideal environments for both uptake and denitrification, because of their high productivity and anoxic conditions, respectively. However, few studies have examined the nitrogen removal efficiency of constructed wetlands or the factors (soil, vegetation, hydrology) that might control this efficiency. The primary goals of this project are: (a) to learn how effective constructed wetlands can be as a means to improve surface water quality to support healthy ecosystems and (b) to better understand the ecosystem dynamics that drive nitrogen removal rates in Connecticut constructed wetlands. I am measuring the input and output of nitrogen for every storm event feasible, at two constructed wetland sites in Hamden and Woodbridge, Connecticut. It is vital to mitigate the hypoxia levels in Long Island Sound that are leading to fish die-offs. The use of constructed wetlands for the habitat they provide and their filtering capabilities could help reduce pollution and conserve the biodiversity of the estuary.

TARA WILKINSON

McGill University, Montreal, Quebec, Canada
Master's, 4th year

CAN WE HAVE OUR FISH AND EAT THEM TOO? A CASE STUDY OF THE BARBADOS MARINE RESERVE

Marine reserves are increasingly being recognized as key components in helping to protect the environment, in assisting fishers make a living, while also facilitating empowerment. Despite their

proposed strengths, marine reserves are not welcomed by all. Although there is a growing mass of studies seeking to understand the biological impacts of marine reserves, studies addressing social concerns are less prevalent. If the socioeconomic aspects are not addressed, conservation will be undermined. Here, I evaluated the effectiveness of the Barbados Marine Reserve in terms of the benefits it provided conservation (fish abundance, over time, within compared to outside the reserve) and fishers (catch, over time, adjacent to the reserve compared to further away; sightings of fishers “fishing the line”; and empowerment of fishers). The data suggest that the reserve did benefit both conservation and fishers in many, but not all, ways: a) increased fish inside (ratio of abundance 2002/1987 inside 4X adjacent sites’); b) increased catch just outside (catch ratios for 2003/1987 and for fish kill recoveries greater for sites adjacent to the reserve than for sites further away); and c) sightings of fishers fishing the line. However, when stakeholders were asked if they felt they had taken part in decision-making, most said they had not. The findings, although quite positive, could be explained by many different factors (e. g., dissimilar sites compared; error in recording catch). Because this study largely takes advantage of previously existing data, a more pointed and detailed study should be conducted to test these preliminary findings.