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Letter from the Director



As the year draws to a close, it's a good time to reflect on the accomplishments and the challenges ahead for conserving species and their habitats. Last week, I returned from two weeks in Bhutan. I was amazed at how this small country is succeeding to conserve its rich biodiversity while others are failing. While the per capita income of Bhutan is similar to many developing countries, they have nevertheless been successful in conserving 60% of the country's forests and have set aside 40% of the country's land area as National Parks. It's a nation where fruits and vegetables are grown organically by law and even snow leopard populations are stable. Why is Bhutan successful? Relatively small human populations and a culture steeped in Mahayana

Buddhism helps, but much of its success seems rooted in how people view nature. Rather than seeing nature as something to conquer and subjugate, the Bhutanese celebrate it and believe it's part of them. The cranes of the Phobjikha Valley illustrate a poignant example of what I mean. During the winter, the valley harbors a large percentage of the world's threatened black-necked crane population. But when villagers living there were offered electricity, they opted out. They feared the cranes they loved would be injured by the wires. Recently, electricity was provided via underground cables, a win-win for people and cranes. The story underlines what can be accomplished when biodiversity is revered - we have much to learn from the Bhutanese.

We hope you enjoy the three feature articles in the CTR newsletter. The first, by Tim Bonebrake, recounts a personal journey of studying butterflies and what they have to teach us. The second, by Rachel Johnston, describes exciting new research on identifying the genes important in bird migration. Finally, a penetrating article by Tom Narins explores how economic expansion by China is changing the face of the Congo Basin.

Very best wishes,

Tom Smith
Director CTR

FEATURED ARTICLE | REFLECTIONS

What Can a Little Brown Butterfly Tell Us About Tropical Climate Change Impacts?

By DR. TIMOTHY BONEBRAKE

CTR Senior Research Fellow and University of Hong Kong faculty member

One of the things I enjoy most about field work is the disconnectedness. I have spent countless sleepless nights under a mosquito net wondering ‘how did I end up here’ or ‘how many days until I’m able to get a hot shower?’ Back home in Hong Kong (or previously in California), I rarely get the opportunity to mull some of life’s larger questions endlessly over many long days and nights. Too many emails to be answered and my bed is too comfortable.

I’ve spent most of the past two summers working in Cameroon and Gabon with the Central African Biodiversity Alliance as part of an NSF Partners for International Research Education program. I’ve been studying a small brown butterfly, *Bicyclus dorothea*, in order to better understand how tropical species may respond to climate change. But on many late summer nights, I have pondered...

How did I end up here in Central Africa?

As an undergraduate at UC Berkeley, I knew I wanted to study ecology and conservation. So, even before I officially started at Berkeley, I sent an email to Dr. Steve Beissinger and asked if there were any projects I could help out on. When I got to Berkeley, I immediately began working on data from a long-term study on parrotlets in Venezuela. Not long after, I was doing my undergraduate thesis on these birds. The work was enjoyable but it wasn’t until I actually went to Venezuela in the summer of 2004 that I decided that tropical biodiversity would forever be a part of my life and research career. Scarlet macaws, capybara, capuchins and anacondas made quite an impression on my punk-kid undergraduate self. I was and still am obsessed with the disparity between what we know about temperate (much more) and tropical (much less) species and the diversity between the temperate (much less) and tropical (much more) latitudes.

The second “aha! moment” came during the first year of my PhD studies. At the time, I knew I wanted to study tropical biodiversity and conservation, but I didn’t know much beyond that. In one week, two things happened which set my PhD thesis in motion. First, I stumbled on Janzen’s *Why mountain passes are higher in the tropics* paper. Second, I attended a seminar by Curtis Deutsch (at the time a professor at UCLA and about five



The Light Bush Brown butterfly, *Bicyclus dorothea*, is a forest butterfly commonly found in lowland forest areas throughout Cameroon and Gabon.



Michel Arnaud Dongmo Kenfak, PhD student, catching butterflies in Campo-Ma’an National Park in Cameroon using fruit-baited butterfly traps.



Larvae of the Light Bush Brown butterfly, *Bicyclus dorothea*, feeding on their staple diet consisting of several species of grass.

years later my postdoctoral adviser), who presented results of a study that highlighted the high vulnerability of tropical ectotherms to climate change. That very week I began drafting up a research proposal to study tropical climate change impacts on ectotherms, which remains the main focus of my research program today (to learn more about some of these advances in tropical climate change impacts over the past several years, see my guest editorial in the *Journal of Biogeography* on Conservation implications of adaptation to tropical climates from a historical perspective).

As a postdoc at UCLA, I was fortunate to have then found my way to

the Center for Tropical Research. I quickly got involved in this exciting initiative led by Tom Smith, Nicola Anthony and Katy Gonder to study evolutionary processes in Central Africa and, specifically, how these processes could be used in the prioritization of regions for conservation in the face of climate change. So, on the various evenings this past summer that I spent picking ticks off my ankles after following elephant trails through a Gabonese rainforest, I could think back and blame this sequence of events for my fortuitous predicament.

Why butterflies?

Less than twenty years ago, climate change was not a significant concern for most conservation biologists. My undergraduate conservation textbook, the 1997 edition of *Principles of Conservation Biology*, had seven pages devoted to climate change, while the 2006 edition has an entire chapter of approximately 50 pages devoted to the subject. This change occurred in the late 1990's and early 2000's when work by Camille Parmesan and others showed that butterflies were responding to recent climate change with significant distribution shifts. Clearly, it wasn't only butterfly research that highlighted the importance of climate change for conservation biology, but I would argue that butterflies were a critical taxon in this development. As pretty insects, they have gained a lot of attention from naturalists over the centuries and as ectotherms they have a high sensitivity to climatic shifts. Both of these factors have together made butterflies key indicators of climate change impacts. Now when I ask my undergraduates at the University of Hong Kong 'what is the biggest threat to biodiversity?', "climate change" is one of the first answers I receive.

Yet, we still know very little about tropical butterflies. Most of the

Mud-puddling, or simply puddling, is a behavior most conspicuous in butterflies that involves taking up nutrients by aggregating on wet soil and dung.





Euphaedra species butterfly captured in Gabon. These butterflies have beautiful patterns that set them apart from other species.

climate change impacts research on butterflies has taken place in Europe and North America. As a consequence, we are far behind in our projections of how climate change might impact the part of the world where most species live, i.e., the tropics.

***Bicyclus dorothea*, the butterflies of Central Africa and climate change**

Our research in Cameroon and Gabon aims to address some of these significant gaps in our current understanding of how climate change might impact biodiversity globally. For over a year now, in collaboration with Dr. Rachid

Hanna of the International Institute of Tropical Agriculture (IITA), we've been studying the thermal tolerance of the butterfly, *Bicyclus dorothea*, in Cameroon. *B. dorothea* is a small, brown (some might say dull) and rather inconspicuous butterfly. But it's also a congener of the well-studied *B. anynana* which has become a model species for understanding phenotypic plasticity, thanks to Paul Brakefield and colleagues. In this way, we then hope to understand how plasticity might factor into climate change responses for tropical ectotherms.

Michel Dongmo, a Ph.D. student at IITA and the University of Yaoundé I, has recently perfected the rearing techniques for this species – not an easy task given how little is known of its biology and habits. He is now starting to test experimentally how thermal tolerance and morphology of the species varies under differential rearing conditions. Ultimately, we hope to use this information to better understand phenotypic plasticity and how plastic responses might inform conservation prioritization under climate change.

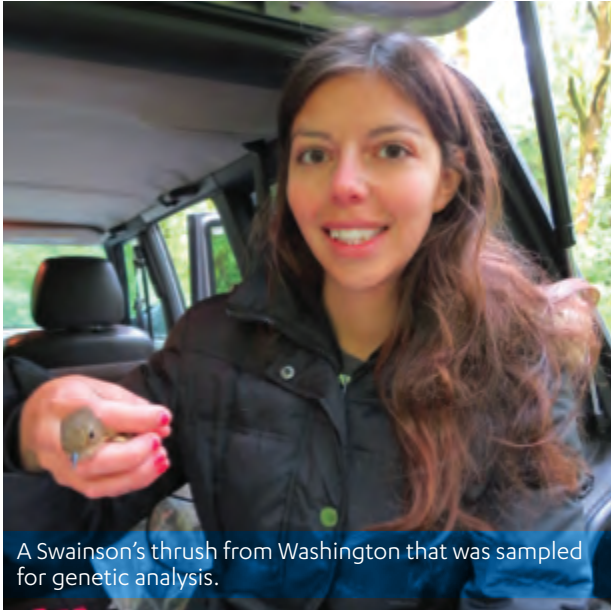
But we also need basic biodiversity data. If we are to ever detect the kinds of climate change effects on tropical butterflies as those observed in European or North American butterflies, then we need monitoring. In Gabon, we've begun a monitoring program in collaboration with Lisa Korte and Yves Basset of the Smithsonian Institution. Starting this past summer, we've begun monitoring butterflies with standardized protocols at the Rabi forest plot. This effort will serve a number of other efforts, including characterizing the little-studied butterfly biodiversity in Gabon and providing baseline information for future studies on climatic and environmental change.

Final thoughts on global change

I went to Africa to study climate change. But the rampant effects of poaching are inescapable both in Africa and my home here in Asia. Headlines of Cameroon-sourced ivory and pangolin busts are common in Hong Kong and elephant populations are plummeting in Central Africa due to the Africa-Asia wildlife trade.

Global change challenges require global solutions. To solve the problem of elephant poaching, we need Asia, Africa and the rest of the world to work together. As for climate change, China now leads the world in greenhouse gas emissions. Conserving the world's biodiversity in the face of climate change will therefore require international partnerships. Hopefully, our research on this small brown butterfly will be a step in the right direction and such collaborative research and education efforts across so many countries will improve our capacity to adapt (socially and institutionally) to climate change.

You can read more about Tim and his exciting research program at <http://web.hku.hk/~tbone/>



A Swainson's thrush from Washington that was sampled for genetic analysis.

FEATURED ARTICLE

Identifying Genes Underlying Avian Migration

By RACHEL JOHNSTON

Graduate Student, UCLA Department of Ecology and Evolutionary Biology & Center for Tropical Research

Migration is a fascinating behavioral phenotype crucial to the survival of a vast number of species, including birds, insects, and mammals. These large-scale movements are perhaps most notable in birds, with an estimated fifty billion birds, representing half of all bird species, migrating every year. This extraordinary behavior has captivated people for centuries and has broad ecological effects, from impacting disease dynamics to long-distance transportation of resources.

With increasing threats of habitat destruction and climate change, the ability of migratory species to change their migration behavior (e.g. timing,

orientation, or distance) to locate suitable environments is a significant concern. If migration is a plastic trait (meaning animals can change their migratory behavior within a lifetime), these species may be able to modify their behavior to migrate to appropriate environments. However, if migration has a strong genetic component, migratory species may adapt on a time scale too slow to keep up with rapidly changing environments. Elucidating the mechanisms underlying migration is imperative to understanding the adaptive potential of migratory species, yet these mechanisms are virtually unknown.

The goal of my project is to investigate the genetic control of migratory behavior. I'm studying the Swainson's thrush, *Catharus ustulatus*, which is a neo-tropical migratory songbird ideal for studying migration. The species is made up of two genetically distinct populations that diverged approximately 10,000 years ago, and based on molecular, mark-recapture, and geolocator data, have dramatically different migratory pathways. The Coastal population breeds along the Pacific coast of the United States and Canada and migrates south to Central America and Mexico. By contrast, the Continental population breeds across the boreal forest of the United States and Canada and migrates southeast and then south across the Gulf of Mexico, wintering in South America. The different migratory patterns are believed to be genetically based, providing the opportunity to identify the genetic differences between the populations to understand how migration is controlled.

To identify migration-related genes, I worked with collaborators Kristina Paxton and Frank Moore at the University of Southern Mississippi, who maintained Swainson's thrushes (from each of the two populations) in captivity for one year. Each day's amount of "lights on" was adjusted to mimic the changing daylength of the seasons, so that the birds knew when it was time for spring and fall migration. This resulted in the birds showing seasonal migratory activity, in this case hopping, which could be monitored throughout the year with motion detectors (this species travels at night during migration but sleeps at night the rest of the year, so we can tell when they are in the migration state by measuring their night activity). We then used high-throughput sequencing techniques to measure the expression of the birds' genes in non-migratory and migratory periods to identify which genes were turned on or off during migration. We identified hundreds of genes that were up- or down-regulated in all the captive birds during migration. This is the first time these genes have been associated to migration, so we are now working to understand the specific roles these genes play during the migratory period.

Having identified migration-related genes in captive birds, we now hope to understand how these genes are regulated in wild birds across different environments. To achieve this, I did field work with Kristen Ruegg and Sirena Lao to collect samples from wild Swainson's thrushes from the Coastal and Continental populations in Washington. The results from this work will provide much-needed insight into the mechanisms underlying this remarkable behavior in the Swainson's thrush and potentially in other species.



Coastal (black) and Continental (gray) breeding and wintering grounds. Light gray: hybrid zone. Dotted lines: inferred migration pathways. Modified from Ruegg et al., 2006.



Sirena Lao handling a Swainson's thrush captured with a mist-net.

FEATURED ARTICLE

Assessing China's Economic Engagement in the Congo Basin Using Kribi, Cameroon as a Focal Point

By TOM NARINS

Graduate Student, UCLA Department of Geography

International trade theory states that when two economies trade the 'factors of production' (i.e. products, labor or capital) that they each have (in abundance) with each other, that both economies will tend to prosper and develop over the long-term. With the rapid and much discussed increase of Chinese trade and investment interest in Africa over the past three decades, many academic and media observers are questioning whether Chinese economic activity in Africa represents a mutually beneficial endeavor or is simply another instance of neocolonialism in Africa. To assess whether Chinese economic actors' acquisition of African raw materials (such as timber, petroleum and minerals) is benefitting China while also helping to develop local African economic and societal infrastructure, I have embarked on a research project that focuses on tracking both Chinese imports into Cameroon and Cameroonian exports to China via a newly constructed deep seaport in the town of Kribi.

My research combines field interviews and economic data gathering with development economic theory to investigate the impact that China's economic engagement in the developing world is having on both the local economies and also on China itself. While my focus is on Chinese state and business actors, my field sites are always beyond China's borders – in the countries or regions where Chinese actors are competing with the major foreign investors (usually the US or EU economies) to secure much needed natural resources, new markets for Chinese products and/or investments with high rates of return. To date, my field sites have been in smaller economies in the developing world, such as in Bolivia and Chile, and have involved my building a Chinese economic profile consisting of trade, investment and loan/economic aid data – much of which is not provided by Chinese authorities and must therefore be collected from local government agencies or from knowledgeable third parties, such as consultants, financial reporters or academic scholars familiar with 'South-South' trade.

Because of Kribi's position at one of the western most points of the Congo Basin Watershed, goods that are loaded onto ships at the newly constructed deep seaport at Kribi not only represent China-bound, Cameroonian natural resources, but, in all likelihood also

represent exports originating in neighboring economies such as the Central African Republic, Chad, Congo and the Democratic Republic of the Congo.

This year, I spent 10 days in Cameroon conducting a Kribi site visit and making collaborative research plans with a Cameroonian economic specialist at the US Embassy in Yaoundé for a follow-up study in 2015. At that time, I will gather and create a Chinese 'economic trade footprint' using port customs data gathered from Cameroonian authorities at the Kribi port. The hope is that accessing and constructing such a footprint, will also paint a picture of contemporary Chinese trade and investments in the Congo Basin more accurately. This fact-based, economic assessment of Chinese economic activity will ideally serve as either a call to action on behalf of wildlife conservationists or as an alleviation of fears that Chinese economic activity in the region is harming local and national economies.



A Tri-lingual announcement of China Harbour Engineering Company's newly completed Kribi Deep Seaport located at the western edge of the Congo Basin Watershed in Kribi, Cameroon.



A view of the newly completed Kribi Deep Seaport, Kribi Cameroon. This facility was completed and opened for operations in August 2014.

CTR Updates

FIELD RESEARCH TRIPS

Nicola Anthony, with colleagues from the University of New Orleans (UNO) and Université des Sciences et Techniques de Masuku (USTM) co-organized a three-week field school in Gabon for 20 students from the U.S. and Gabon as part of the 2014 activities of the CAB-Alliance program. This course was run at the USTM campus and the Lope National Park in Central Gabon, recently declared a World Heritage site. Students were all required to participate in a ten-week seminar and take intensive language courses prior to arriving in Gabon. Students were assembled into international teams before leaving for the field, took part in an introductory training session in research design, sampling methods, GIS, statistical analysis of ecological data and line/transect census sampling. Each research team then designed their own research projects, collected the data, analyzed it, and presented their findings to the rest of the class in English and French. In order to complete the course, students also wrote up their findings as a research paper in English and French.

Vanessa Apkenas participated in the PIRE Professional Development Workshop this summer in Yaoundé, Cameroon. She then joined a team of CTR researchers to the Dja Faunal Reserve and Baka villages for three days, hiking through the forest with Baka guides and observing mist-netting techniques. Afterwards, she travelled with Thomas Smith, Tim Bonebrake, and Matt Mitchell to Gabon and assisted with a CAB-Alliance undergraduate field course in Lope National Park. While there, she participated in bird and small mammal fieldwork.

Jordan Karubian visited graduate student projects in Papua New Guinea, Australia, and Ecuador over the summer. He is now busy planning and organizing the third annual Environmental Fair that he and his colleagues at Fundacion para la Conservacion de los Andes Tropicales put on each year in northwest Ecuador.

Brenda Larison visited the lab of Leif Andersson at the University of Uppsala in Sweden for the month of January to work on the analysis of sequence data for her project examining the genetic and adaptive bases of stripe variation in plains zebra. In October, she also visited the lab of Greg Barsh at Hudson Alpha Institute for Biotechnology in Alabama to work on the analysis of sequence data from aberrant melanistic and spotted plains zebra, which they expect to shed additional light on the genetic mechanisms controlling striping.

Kevin Njabo, Thomas Smith, and field assistant Francis Forzi carried out a small-scale sampling of wild birds via mist nets this past July as part of the NSF-PIRE grant. Samples were collected in the Dja Forest Reserve in Cameroon, and included two PIRE target species, olive sunbirds (*Cyanomitra olivaceae*) and little greenbuls (*Andropadus virens*).

Thomas Smith, Walter Allen, and Tom Narins visited Kribi in southern Cameroon in July as part of CTR's interdisciplinary research and education projects in Central Africa. Cameroon's existing container port at Douala is operating at capacity, which prompted the development of a new deep water port 15 miles south of Kribi. The new port will be used to export iron ore, aluminum ore, oil, natural gas, and other minerals from Cameroon and the Democratic Republic of Congo via a rail line that is under development.

Madeline Tiee visited the mammal collection at the American Natural History Museum to acquire squirrel skin samples during September and October. These samples are being used for a project that aims to understand the historical range and diversity of monkeypox virus within one of its natural hosts in Central Africa.

OTHER NEWS

Vanessa Apkenas began her first year as a PhD student in CTR's laboratory with Thomas Smith serving as her advisor. She was awarded a prestigious NSF Graduate Research Fellowship to support her research.

Nicole Arrigo joined the staff at CTR in January as Associate Director after completing a postdoctoral position in Pathogen Discovery at Columbia University's Center for Infection and Immunity. Her previous experiences in public health, epidemiology, and research focused on the ecology, evolution, and transmission of zoonotic pathogens is an excellent complement to CTR's current research projects. As part of the CTR team, Nicole is primarily assisting with the development of the Congo Basin Institute (CBI), management of the NSF PIRE award, and involvement in the Congo Basin Forest Partnership (CBFP).

Eduardo Santana Castellón has been coordinating the design of a new "museum of environmental sciences" at the University of Guadalajara's Cultural Center, in the State of Jalisco, Mexico. The construction of the 195,000 square foot museum will begin in 2015. Scientific and conservation content was developed by a team of Mexican ecologists, urbanists, and conservationists. Museology and museography

CTR Updates

OTHER NEWS, CONTINUED

is being developed in collaboration with some of the best exhibit designers in the world. The museum promotes conversations on how cities depend on nature to survive.

Jaime Chaves completed a postdoctoral fellowship at the University of Miami. In January, he accepted a tenure track faculty position as a Professor at Universidad San Francisco de Quito in Ecuador where he continues his research in the Galapagos Islands. Jaime was also appointed as a merit-based member of the Academy of Sciences of Ecuador and gave a presentation at the annual Evolution meetings in Raleigh, North Carolina in June.

Franck Courchamp joined CTR and the EEB department as a Visiting Scholar in September for one year while he is on sabbatical from CNRS at Université de Paris South, France. During his tenure, Franck will be working on several projects, including the impacts of invasive insects following climate change, biodiversity, economics, and human health.

Emily Curd is writing up her dissertation research on patterns of soil diversity across a vegetation gradient and soil microbial metabolism using metagenomic and extracellular enzyme activity data. In June, she received the Department of Ecology and Evolutionary Biology's Schechtman Award for teaching assistants and a UCLA Office of Instructional Development Teaching Assistant Mini-Grant.

Ryan Harrigan was appointed Assistant Adjunct Professor with the UCLA Institute of the Environment and Sustainability in July.

Rachel Johnston presented her genetics work on Swainson's thrush at the Joint Meeting of the American Ornithologist's Union, Cooper Ornithological Society, and Society of Canadian Ornithologists in Estes Park, Colorado in September. She also presented her genetics work on gray wolf cell lines at the Evolution Conference in Raleigh, North Carolina in July.

Jordan Karubian received a grant from the National Science Foundation for work on white-shouldered fairywrens in Papua New Guinea.

Alison Lipman from SELVA International received a \$90,000 Non-Profit Community Partnership Outreach Grant from the Los Angeles Department of Water & Power to improve water conservation throughout Los Angeles. They are partnering with the Green Gardens Group, Surfrider's Ocean Friendly Gardens, and the LA Beautification Team to implement community outreach and education activities to help Los Angeles residents convert their water thirsty grass to drought tolerant California friendly landscapes.

Kevin Njabo and Thomas Smith attended the 14th Meeting of Partners and Anchor Conference of the Congo Basin Forest Partnership (CBFP) in Brazzaville, Republic of Congo in early October. The central theme was "Opportunities and Challenges - Climate and Land Use in the Congo Basin." The conference was facilitated by the U.S. State Department and the Republic of Congo, with financial support from the consortium members, including Norway and Germany, and support of the International Union for the Conservation of Nature (IUCN). The conference was attended by over four hundred delegates representing ECCAS, COMIFAC, Heads of Diplomatic Missions and representatives of the countries of COMIFAC, research institutions and sub-regional institutions, civil society organizations, CEFDHAC, and technical, financial, and private sector partners. Kevin presented updates on the Dja REDD+ project as part of the key Innovation Alley.

Hilton Oyamaguchi completed his dissertation research on the role of ecology in driving the diversification process along the Amazon-Cerrado gradient. He received his Ph.D. from the Department of Ecology and Evolutionary Biology at UCLA in March. Hilton has accepted a Visiting Assistant Professor position at University of the Pacific where he is investigating the thermal tolerance of tungara frog tadpoles (*Engystomops pustulosus*) from Panama.

Kathryn Peiman entered the Sigma Xi virtual research showcase, an international competition for high school students, undergraduates and graduates. The competition involves posting a personal video, abstract, and technical powerpoint slide presentation. Kathryn competed within her division (graduate) and category (EEB), and won First Place. The winners in each division and category then compete for the overall division winner across all categories. Congratulations are in order as Kathryn also won Overall First Place in the graduate division.

Kristen Ruegg presented her research on mapping migration in a songbird using high-resolution molecular tags at a symposium on "The future of migratory connectivity" at the American Ornithological Union in Estes Park, Colorado. Her research on the genomic landscape of divergence in a migratory bird, the Swainson's thrush, was presented in a symposium on "Genomics and Adaptations in Diverging Populations" at Lund University in Sweden.

CTR Updates

OTHER NEWS, CONTINUED

Ravinder Sehgal, Thomas Smith, Kevin Njabo, and Ryan Harrigan led an NSF Research Coordinated Network training workshop in Yaoundé, Cameroon from June 30-July 05. The African International Workshop on Malaria and Related Haemosporidian Parasites was geared towards African graduate students, postdoctoral researchers, and other investigators new to the fields of wildlife haemosporidians and wildlife conservation. See Workshop Report II for more details.

Thomas Smith and colleagues from UCLA, in collaboration with Drexel University, Universities of Yaoundé I, Dschang and Buea co-organized a Professional Development Workshop focused on integrating biological, socioeconomic data and modeling for conservation planning in Central Africa. The workshop was held from July 7-13 in Yaoundé, Cameroon. The Professional Development workshop is part of the Central African Biodiversity Alliance (CABAlliance) that enables international collaborations in research and education to advance scientific solutions to daunting global challenges. See Workshop Report I for more details.

Thomas Smith presented a lecture on April 30, 2014 entitled “Challenges to Conserving the Congo Basin Rainforest: Climate Change and the Second Scramble for Africa” as part of the Institute of the Environment and Sustainability’s Oppenheim Lecture Series. The full-length presentation can be viewed here: <http://youtu.be/eMUrXDAhQal>

Thomas Smith travelled to Lagos and Ibadan in Nigeria for a special site visit at the International Institute for Tropical Agriculture’s (IITA) main campus in October. The site visit facilitated discussion of the UCLA/IITA joint venture of establishing the Congo Basin Institute on the IITA campus in Cameroon.

Corey Tarwater and Patrick Kelley received a four-year Department of Defense \$2.4 million SERDP grant to study the role of invasive vertebrates in seed dispersal of native and non-native plants in Hawaii. Corey has accepted a faculty position as an Assistant Professor at the University of Wyoming set to commence in January 2015.

Madeline Tiese received a prestigious NSF Graduate Research Fellowship to support her research on monkeypox virus for the 2014-2015 academic year.

Amy Wolfe joined CTR in May as a Visiting Scholar after completing a postdoctoral scholar appointment at UC Santa Cruz. Amy’s research addresses the question of how species interactions shape ecosystem processes in the context of ongoing global change.

Ying Zhen joined the labs of Thomas Smith and Kirk Lohmueller in October as a postdoctoral scholar for the NSF-PIRE grant. She will be focusing on analyzing genomic data in non-model systems in Africa.

PUBLICATIONS AND PRESS

Allison Alvarado and colleagues published a paper in *Ecology and Evolution* entitled “Integrative tracking methods elucidate the evolutionary dynamics of a migratory divide.”

Anthony Chasar and colleagues published a paper on the spatial and temporal patterns of frugivorous hornbill movements in Central Africa and their implications for rainforest conservation that appears in *Biotropica*.

Jaime Chaves co-authored three papers on avian diversification this year in the *Journal of Biogeography*, *Molecular Phylogenetics and Evolution*, and *Evolutionary Applications*.

Sonal Pandya Dalal and colleagues published a chapter on an investigation on ecosystem services and the role of investment banks, and investment products to foster conservation in the book [Responsible Investment Banking](#). As banks have done in the past with global challenges such as rebuilding in the aftermath of WWII and financing the industrial revolution, they have a central role to play in helping society meet their development goals in a resource-constrained world. In preparing for the challenges of this next century, society will need to manage issues such as population growth, food and water scarcity, and climate change while preserving the ecosystem services that underpin economic growth. “Sustaining innovations” in a banks’ business model are required—those that transform banking products to generate environmental and societal benefits. Banks can manage risk and seek opportunities by deploying latent capital into revolving funds, leverage public-private partnerships to develop the absorptive capacity of potential clients (particularly private equity investors), and establish innovative financial products that conserve ecosystem services in support of healthy, sustainable societies.

CTR Updates

PUBLICATIONS AND PRESS, CONTINUED

Jean Bernard Dongmo and colleagues published an article in the *African Journal of Ecology* entitled “Sexual size dimorphism and morphological divergence in the Yellow-whiskered Greenbul in the Guineo-Congolian rainforest of Africa.”

Trevon Fuller and colleagues published a paper entitled “Identifying areas with a high risk of human infection with the avian influenza A (H7N9) virus in East Asia” in *Journal of Infection*. H7N9 is a type of influenza that spreads from poultry to humans and has generated concern due to its 30% fatality rate. This paper developed a risk model using H7N9 outbreaks in eastern China from March-May 2013 along with remote sensing and transportation data. Based on cases from the first half of 2013, the model correctly predicted the introduction of H7N9 into Guangxi autonomous region in southern China in January 2014 and into Jilin province in northern China in February 2014. By forecasting viral spread up to six months in advance, this approach gives decision-makers enough time to implement control measures, such as closing poultry markets, potentially reducing the number of human infections.

Ryan Harrigan published a paper in the journal *Global Change Biology* entitled “A continental risk assessment of West Nile virus under climate change.” This paper was featured in various news outlets including *TIME* magazine and Ryan was interviewed on multiple radio stations on this topic. Ryan and coauthors also completed work on avian malaria in South America and published the findings in a paper entitled “New host and lineage diversity of avian haemosporidia in the Northern Andes” that appears in *Evolutionary Applications*.

Brenda Larison and colleagues published a paper in *BMC Veterinary Research* entitled “Spillover of the pH1N1 to swine in Cameroon: an investigation of risk factors.” This study examined farming practices that lead to influenza infections in swine in Cameroon. The motivation for the research was the 2009 influenza pandemic that originated in swine and spread to human populations around the world. The results of the study indicated that in Cameroon, the practice of confining swine to pens reduces the risk that herds will be infected with the influenza virus. This finding can improve human and animal health in Central Africa.

Kristen Ruegg and colleagues published a paper entitled “A role for migration-linked genes and genomic islands in divergence of a songbird” in the journal *Molecular Ecology*. This article was highlighted in a *News and Views* piece in the same journal. Another paper by Kristen and colleagues was also published in *Molecular Ecology*, entitled “Mapping migration in a songbird using high-resolution genetic markers.” This highly anticipated article garnered much press, including a write-up in *Science* magazine in advance of its formal publication. A summary can be found here: <http://news.sciencemag.org/biology/2014/08/hidden-bird-migrations-revealed-dna>

Sassan Saatchi, with colleagues from NASA and other universities, co-authored a publication in *Nature* entitled “Widespread decline of Congo rainforest greenness in the past decade.” The article was also featured in a *News and Views* piece in the same journal and a summary of the work was featured in the *New York Times* highlighting the negative effects that prolonged droughts in Central Africa are having on tropical forests and the role climate change plays in its deterioration.

Thomas Smith co-authored a paper entitled “Applying evolutionary biology to address global challenges” published in *Science*. A second co-authored paper was published in *Annual Reviews of Ecology, Evolution, and Systematics* entitled “Prescriptive evolution to conserve and manage biodiversity.” A common theme in these papers is the concept of prescriptive evolution. That is, the notion that man-made evolution is already in full swing and to better control its effects, human beings should apply evolutionary biology principles to consciously shape and direct evolutionary processes. Tom was interviewed for both papers with features appearing in the *Huffington Post*.

Kelly Swing and colleagues released a book in Spanish this year on the Yasuni Biosphere Reserve and their research station, entitled [Yasuni, Tiputini and the Web of Life](#). The original English version was released the previous year. This publication includes hundreds of high quality photographs in combination with accessible scientific writing that explains various topics related to one of the most biodiverse regions on the planet and the threats that it faces. A review article on the value of scientific collections was published in Spanish in September as a call for re-evaluation of policies across Latin America in relation to attitudes associated with how research and collecting permits are managed. Kelly also published a chapter on evolution in relation to environmental impacts and extreme species loss in the book [Why does evolution matter? The importance of understanding evolution](#).

CTR Updates

ANNOUNCEMENTS

Progress on the Establishment of the Congo Basin Institute (CBI)

The University of California, Los Angeles (UCLA) and the International Institute of Tropical Agriculture (IITA) are together leading a multi-institutional initiative to create the Congo Basin Institute (CBI) in Cameroon <http://www.environment.ucla.edu/ctr/initiatives/index.html>. The Center for Integrated Development/Cameroon (CID/C), as it was formerly known, has been renamed the **Congo Basin Institute (CBI)** to better reflect its mission to serve as a regional nexus for interdisciplinary research, education, training and technology development focused on critical issues facing the Congo Basin: climate change and its impacts, water and food security, and human and animal health.

With a green-designed campus as its foundation, the CBI is a unique and scalable model that embodies long-term capacity building, sustainability, and finding practical solutions to critical needs. This iconic physical infrastructure will provide additional support for CBI's programmatic activities and promote long-term social and educational development through the construction of: 1) a distance learning center for US and African students, 2) digital data repositories, 3) technical training and equipment repair facility, 4) remote sensing and GIS research and training lab, 5) molecular genetics and analytics lab, 6) platform/technology test bed innovation facility, 7) incubator for start-ups and entrepreneurs, 8) lodging and conference center for an international community of scientists and researchers, and 9) logistics and administrative office to assist and facilitate local partnerships. Detailed building renderings of Gensler's green designs for the CBI can be seen at the following link: <http://www.environment.ucla.edu/ctr/pdfs/CBI-Narrative.pdf>.

The CBI capital campaign is in full swing and has made rapid progress with significant dedication to financial, legal and strategic development. Phase I construction will require an initial investment of 7M USD to upgrade established facilities and build a distance learning center and dormitories on the existing IITA partner campus. Total infrastructure, programmatic, and operational costs for the CBI are projected at 40M USD, with 17M USD match funds already committed. A promotional video about the CBI can be viewed here: <http://youtu.be/Wo7kgHK942I>

UCLA's dedication to building a sustainable and integrative scientific network in Cameroon began four years ago with the establishment of the UCLA International Research and Training Center (IRTC) in Yaoundé (<http://www.irtc.ucla.edu>). This facility provides lodging for scholars, logistical support, and an environment that promotes scientific exchange and collaboration between African and international scholars. To date, the IRTC has already assisted over 800 scholars from 15 countries in various educational and research endeavors, many of which have resulted in local and regional collaborative projects. Funded through a fee-for-use system, the IRTC continues to be financially self-sustainable; however, the demand for use of the facility has far exceeded its capacity. The creation of the CBI will answer this demand and, more importantly, will create a model that builds on this culture of collaboration and innovation, creating opportunities for positive social, educational, environmental, and economic transformation.

Collaborative interest in the CBI continues to flourish with over 36 UCLA faculty members from 17 divisions and schools currently engaged in this UCLA/IITA – led consortium. Other consortium partners include Drexel University, the University of New Orleans, the University of Wisconsin-Madison, the Center for International Forestry Research (CIFOR), University of Maryland (UM), and the World Agroforestry Centre (ICRAF), which is dedicated to improving food security and increased resources for energy, sustainable agriculture and ecosystem services. Also involved are all seven major universities of Cameroon and the Centre Pasteur-Cameroon, a major contributor for more than 60 years to the prevention and treatment of infectious diseases in Cameroon through research, teaching, and public health initiatives.

The Betty and E. P. Franklin Grant in Tropical Biology and Conservation was established in 2013 thanks to an endowment provided by the Franklin family. Now in its second year, this annual grant has provided travel awards to UCLA graduate students conducting field research in the tropics. Many exciting proposals were received this cycle and CTR was able to grant a total of four awards. Recipients included Sarah Joy Bittick whose dissertation work focuses on two foundation species--*Turbinaria ornata*, a brown macroalga in the South Pacific and *Zostera marina*, eelgrass, in California--and the mechanisms that influence the persistence and stability of the communities these important species support; Charlie de la Rosa who is studying the drivers of foraging and ranging behavior of free-roaming cattle, and their impact on plant community structure in the tropical deciduous forest near Alamos, in southeastern Sonora, Mexico; Tyler McCraney who is studying shrimp-goby codiversification in the Coral Triangle to determine if cooperation can be a key innovation; and Kathryn Peiman who is interested in the ecological and evolutionary effects of interspecific competition between the resident Thick-billed Vireo (*Vireo crassirostris*) and migrant White-eyed Vireo (*V. griseus*) that coexist in the Bahamas during the non-breeding season.

WORKSHOP REPORT I

Annual Professional Development Workshop for the National Science Foundation's Partnership in Research and Education

BY DR. RYAN HARRIGAN

Assistant Adjunct Professor, UCLA Institute of the Environment and Sustainability

In July, a group of CTR scientists, led by Drs. Kevin Njabo and Ryan Harrigan, and CTR Director Thomas Smith, traveled to Cameroon, Africa, to help lead an intensive six-day workshop centered on professional development of international students. This was the first workshop to be held in Cameroon as part of the PIRE effort, and involved intensive coursework focused on geographic information systems (GIS), population genetics, and conducting a variety of statistical analyses on real wildlife datasets using the R programming language. Students from North America, Europe, and Africa met over the course of six days to better understand the latest tools researchers are using to conduct scientific analyses. All lessons featured free software packages and data sources, ensuring that expensive software or lack of data would not impair further research efforts for students continuing their work once the workshop had completed.

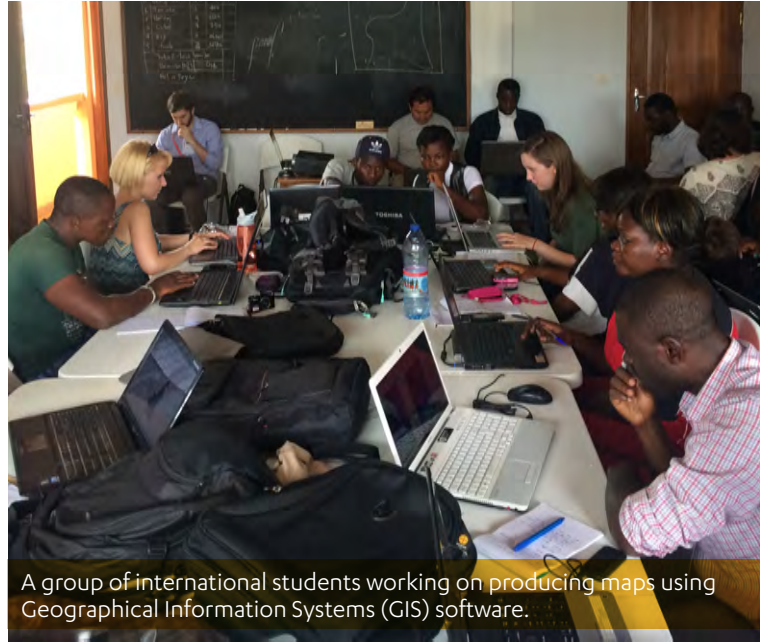
Students and instructors from around the world gathered in Yaoundé, Cameroon, Africa, for the second professional development workshop to be held to bring the latest research and technology to Central Africa. Partners included researchers and faculty from the University of California, Los Angeles, Drexel University, the University of New Orleans, and the International Institute of Tropical Agriculture (IITA), who hosted the workshop. Campus facilities were provided by the host and the majority of the workshop was held at the future site of the Congo Basin Institute, a new facility endeavor co-sponsored by UCLA and IITA (for more information see <http://www.environment.ucla.edu/ctr/initiatives/cbi/>).

At the end of the workshop, students were invited to one of two field excursions, to the Dja Biosphere reserve in Central Cameroon, and to Ebo Forest, to catch glimpses of local wildlife and ecological processes first-hand. The students were accompanied by a field crew who were assembling footage for a documentary that is being made to promote the biological research being conducted in the area. Students saw (and heard!) several primate and birds species, including forest gorillas and target bird species of the PIRE, the olive sunbird and little greenbul.

Some of the specific topics covered at the workshop included:

1. Understanding the basics of the R programming language
2. How to interpret and analyze socio-economic and demographic data
3. Using and testing assumptions of basic statistical methods
4. Analysis of population genetic data using maximum likelihood methods
5. Constructing maps using geographic information systems approaches
6. Determining species distributions using maximum entropy models
7. Developing successful leadership skills as young researchers

In addition to these specific topics, students and instructors alike were treated to evening guest lectures from some of the top scientists in their fields, respectively. Talks by Stevan Arnold, Hilary Godwin, Eric Fokam, and Tim Bonebrake highlighted evening talks that kept students both entertained and involved in scientific discussions throughout the week, and beyond. We look forward to the upcoming field course that will be conducted in Cameroon in 2015, and hope to build upon the success of workshops held over the last two years.



A group of international students working on producing maps using Geographical Information Systems (GIS) software.



Each student prepared and presented on their own research topic and received feedback from the group.



An African pygmy kingfisher (*Ispidina picta*) caught in a mist net, and then released after processing.

WORKSHOP REPORT II

African International Workshop on Malaria and Related Haemosporidian Parasites of Wildlife

BY DR. KEVIN NJABO

Assistant Adjunct Professor, UCLA Institute of the Environment and Sustainability

From June 29th through July 5th, 23 African students from Cameroon, Nigeria and Ghana met in Yaoundé, Cameroon to participate in the Malaria Research Coordination Network, NSF-sponsored African International Workshop on Malaria and Related Haemosporidian Parasites of Wildlife. Topics covered during the workshop included bird and mosquito field capture techniques, blood sampling and preparation of blood smears, sample vouchering and preservation, parasite taxonomy, DNA extraction and PCR, parasite taxonomy, light microscopy for parasite identification and parasite and cell counts, sequence data analysis, and geographic information systems.

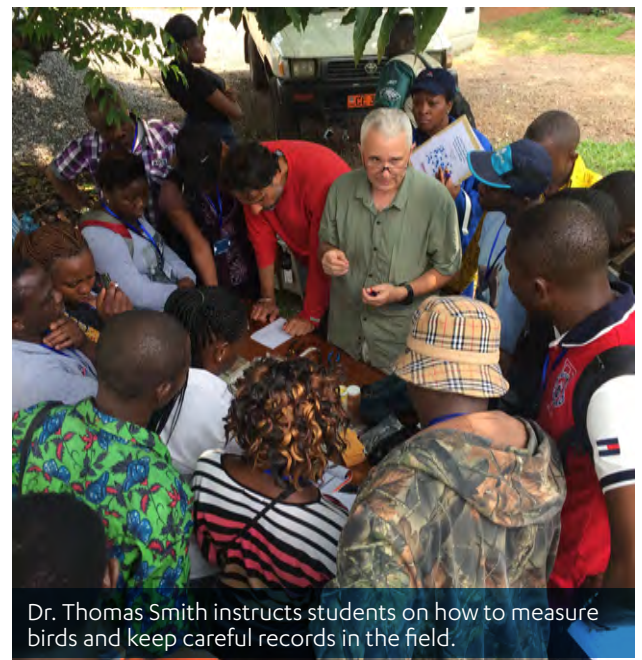
Discussion topics during the workshop included the basic biology, phylogenetics and systematics of Haemosporida, community ecology of parasites, coevolution and the evolution of virulence, and conservation and disease. The course took place at the International Institute of Tropical Agriculture (IITA) in Yaoundé, with additional events at the Centre Régional d'Enseignement Spécialisé en Agriculture Forêt-Bois (CRESA) and the Higher Institute of Environmental Sciences, Yaoundé (HIES).

DNA studies have revealed that the number of avian malaria genetic lineages might be comparable to the number of their avian hosts. Genetic and ecological mechanisms contributing to the evolution of such astonishing genetic diversity and ecological plasticity remain largely unknown. Thus the gathering of actively working scientists, environmental experts and wildlife healthcare professionals is one way to stimulate a robust dialogue regarding the main taxonomic, evolutionary, genomic and conservation problems in this field of research. As a result, the students enthusiastically committed to develop collaborative projects within Central and West Africa.

Instructors for this workshop were Dr. Ravinder Sehgal from San Francisco State University and Dr. Ryan Harrigan, Dr. Kevin Njabo and Dr. Thomas B. Smith from UCLA.



Instructors and students gathered on the final day for a banquet dinner and farewell celebration.



Dr. Thomas Smith instructs students on how to measure birds and keep careful records in the field.