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The Seed

Bi-annual newsletter of the
Center for Tropical Research



CTR research sites around the world

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CTR researchers in
the rainforest, Loma Alta, Ecuador

LETTER FROM THE DIRECTOR

Dear Readers,

In this second issue of the newsletter of the UCLA Center for Tropical Research (CTR) we are pleased to report progress on several fronts. In June a collaborative proposal with UCLA's African Studies Center was funded by the UCLA International Institute to help establish a research node in Cameroon. Since establishing our first research node in Ecuador in January of 2002, we have made great strides toward our goal of initiating a new approach to tropical rainforest conservation by developing long-term partnerships with local collaborators from a range of universities, institutions, and non-governmental organizations.

We have also made progress in establishing the UCLA Conservation Genetics Resource Center, a joint project of CTR and the UCLA Department of Organismic Biology, Ecology, and Evolution that provides expertise, resources, and sample repository facilities for the generation and analysis of molecular genetic data for wildlife conservation applications.

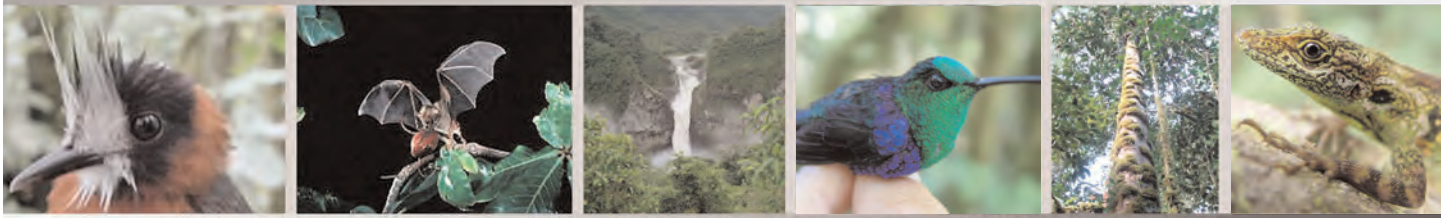
This newsletter includes a roundup of research conducted by CTR faculty, graduate students, and postdoctoral researchers in Mexico, Ecuador, Guatemala, the Bahamas, Uganda, Canada, and the U.S. We are also pleased to include an in-depth article by Dr. Jordan Karubian, Latin America Director of CTR, on the long-wattled umbrellabird.

We welcome contributions to future issues of *The Seed* and we hope that you will share this issue with colleagues.

Sincere Regards,

Thomas B. Smith, Ph.D.

<http://www.ioe.ucla.edu/ctr>



News and Events from CTR

CTR Hosts Successful Open House and Launches \$5 Million Fundraising Campaign

CTR hosted its first Open House on May 14, 2003. The event, attended by 75 people, provided a chance for CTR Affiliated Faculty, Senior Research Fellows, and interested members of the UCLA community to visit the CTR office and meet CTR postdoctoral researchers, graduate students, and staff and to share ideas

with other environmentalists. Good food and lively discussion about research projects in tropical environments made it a pleasurable afternoon for all those who attended.

CTR Director Tom Smith gave an update on CTR research projects worldwide and progress made in building research nodes

in Ecuador and Cameroon. He also announced CTR's plan to launch a \$5 million fundraising campaign to support the nodes and to expand CTR's training programs and field research projects. Members of the UCLA Development Office who are collaborating with CTR on the campaign joined the celebration.

Cuba Research Group Plans Fact-finding Trip

UCLA professor Judith Carney organized a CTR luncheon for faculty and graduate students interested in field research on Cuba. Participants included Professors Tom Gillespie, Glen MacDonald, Hartmut Walter, and student Sarah Blue (Geography Department), Professor Peter Narins (Physiological Science), Sassan Saatchi (NASA/JPL Scientist and Visiting Researcher, CTR) and CTR Director, Tom Smith. The isolation of Cuba has kept academic exchange and international research efforts at a minimum for decades. At the same time,

Cuba has emerged as a crucial link or core area for many disciplines focusing on Central America and the Caribbean. UCLA research projects in evolutionary ecology, biogeography, conservation biology, agricultural innovation, development studies, and marine biology (coral reef biology and conservation) would benefit greatly from collaboration with Cuban researchers and their institutional links. The group formulated a plan for a fact-finding trip to Cuba in search of collaborators and potential study sites for a multidisciplinary research program.



CTR Presentation to Project ASCEND in East Los Angeles

On July 18, 2003, CTR Research Associate Ben Wang visited Centro Maravilla Community Center in East Los Angeles, California to give a presentation to thirty 10-14-year-old students of the Pueblo Science Project ASCEND on what it is like to do scientific research in a rainforest. This NSF-funded extra-curricular science program targets youth from East Los Angeles cultures that are typically underrepresented in the sciences, offering hands-on, project-based exploration of science, math, engineering, and technology in an effort to boost science literacy and understanding and to emphasize its role in the everyday lives of



these children and their families. Another major goal of the program is to encourage these students to choose a career in science.

Wang showed slides of his field research while living in the rainforests of Cameroon

between 1997 and 1999 investigating seed dispersal by hornbills and monkeys. Discussion focused on where and why rainforests exist, the role of fruit and animals in seed dispersal, and why someone in East Los Angeles should care about preserving rainforests. They also watched highlights of a BBC video called "Jungle," parts of which were shot at Bouamir Research Station in Cameroon where CTR ran a field camp from 1994 -1999.

The Seed Editorial Board

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Recent Grants Received

CTR gratefully acknowledges new grant support from the following:

UCLA International Institute, Global Impact Research Grant: Building a UCLA International Research Node in Cameroon.

Disney Wildlife Conservation Fund: Conservation of Umbrellabirds and Ecuadorian Chocó.

UC Institute for Mexico and the United States (UC MEXUS) - Consejo Nacional de Ciencia y Tecnología (CONACYT): Conservation Genetics of Migratory Songbirds: a Molecular Approach to Linking Breeding and Wintering Populations in the U.S. and Mexico.

National Aeronautics and Space Administration (NASA): Quantifying Patterns of Biodiversity in a Changing Climate: Integrating Biological Point and Process Data with Remotely Sensed Environmental Variables.

The Long-wattled Umbrellabird and the Chocó Rainforest

When was the last time you saw an animal as outlandish as the long-wattled umbrellabird? Upon viewing a photo of the long-wattled umbrellabird, the typical reaction is to ask, "What is that thing and why does it look like that?" The species' name provides a good starting point to understand its bizarre appearance. Males have a crest which they can expand to completely cover their heads in all directions, hence the name "umbrellabird." They also have a feather-covered wattle hanging from their necks that is as long as their entire body length (about 18 inches), hence the name "long-wattled." Females are about half the size of males and more restrained in their appearance. One cannot help but wonder why males have evolved such extreme traits.



Female and male umbrellabirds

As director of CTR's research node in Ecuador, I have been studying the social behavior and the basic ecology of the long-wattled umbrellabird with the goal of understanding this and related questions. With the help of Ecuadorian, Colombian, and North American field assistants, I have been testing the hypothesis that these traits have evolved via sexual selection, that is, to increase attractiveness to mates. Male long-wattled umbrellabirds display to prospective mates using their wattles and crests. With the wattle, they produce a low-frequency call audible for over 800 meters through primary rainforest. Because the call resembles a cow's "moo," long-wattled

umbrellabirds are locally known as "vaca del monte" or "pájaro toro" ("cow of the forest" or "bull-bird," respectively). As things start to heat up in courtship, males swing their wattle around the neck of prospective mates, much like a feather boa. Male reproductive efforts, however, do not extend beyond courtship and copulation. Females raise the young alone, with no help from the male.

I have been testing sexual selection hypotheses by relating wattle length, crest height, and the basal frequency of male calls to reproductive success. To do so, I first capture, measure, and mark the birds. My assistants and I observe banded individuals in the field using the number of female visits and copulations as a proxy for reproductive success. At the time of capture, birds are also equipped with a tail-mounted radio which falls off when the birds molt their tail feathers. Radios are lightweight and emit a signal over an area of 2 km², allowing us to track the birds' movements through the jungle.

Radio tracking is particularly handy when investigating another fascinating aspect of long-wattled umbrellabird biology - their role as a disperser of large seeds. Long-wattled umbrellabirds are one of the few avian species in their range that are big enough to transport large seeds an appreciable distance. Large seeded fruit, such as Lauraceae (the avocado family) and Araceae (palms), are characteristic of many tree species found in mature, primary forests. By documenting long-wattled umbrellabird movements via radio telemetry and combining these data with information on foraging ecology and seed passage time, I am quantifying the seed dispersal role that the species plays. Initial data shows that long-wattled umbrellabirds eat the fruit of a wide range of tree species and move frequently between pristine forests and degraded forests, suggesting that the birds play an important role in regeneration of forests.

Regeneration of forests is a theme of critical importance throughout the long-wattled umbrellabird's range, which is restricted to the Chocó biogeographic zone of western Ecuador and Colombia. Chocó forests are among the most humid on the planet, and have been subjected to particularly severe deforestation. In Ecuador, for example, less than 5% of the original Chocó forests

remain. This trend is especially troubling because Chocó habitat is also one of the richest and most diverse on the globe. Over 50 species of bird are endemic to the Chocó (this includes the long-wattled umbrellabird). The Chocó is also estimated to house 20% of the total number of vascular species of plant in South America, and is recognized as the center of palm diversity on the planet.



Male umbrellabird in the Chocó rainforest

As Chocó habitat has diminished, so have populations of long-wattled umbrellabirds and other species endemic to the zone. In the case of long-wattled umbrellabirds, the population is currently less than 20% of its original size and the species is in danger of extinction within Ecuador and vulnerable to extinction throughout its range. Because of its role as a disperser of large seeds, the loss of the long-wattled umbrellabird could have serious implications for the regeneration of altered forests and the maintenance of primary forests. My research on habitat use, foraging ecology, and movement patterns is providing baseline data needed to arrive at a coherent conservation strategy.

What does the future hold for Chocó habitat and endemic species like the long-wattled umbrellabird? The answer to this question is as much a socioeconomic one as a biological one. The Chocó supports a dense human population that is under-educated and economically desperate, with an average family income of less than \$800 per year. The continued survival of the umbrellabird, and Chocó habitat in general, ultimately depends upon improving education and developing meaningful alternatives to deforestation and hunting in the zone. In recognition of this fact, CTR is expanding

Continued on page 6

FIELD NOTES: Recent International Research Projects

Bahamas

Field research in the Bahamas this year focused on two key aspects of lizard evolutionary ecology: large-scale natural selection experiments and the territorial behavior of male *Anolis* lizards. Lizards in the genus *Anolis* are a rare example of vertebrate adaptive radiation, the process by which a taxonomic group undergoes rapid speciation.



Anolis sagrei lizard, Bahamas

CTR postdoctoral researcher Ryan Calsbeek and graduate student Erin Marnocha spent six weeks on the island of Great Exuma capturing, measuring, and permanently marking nearly 500 lizards. A return to the islands next spring will provide information on which lizards have survived. These data will be used to compare attributes of surviving lizards to those that have died, and to understand the role of ecology (e.g., habitat use) in driving the diversification of this group of lizards. This trip marked the beginning of a long-term study of the importance of natural selection acting across many diverse habitat types in the Bahamas.

A second project, aimed at understanding territorial behavior in these lizards, has revealed that male lizards respond less aggressively to neighbors than to strangers, suggesting that once males have established territory boundaries with other males, they forego further interactions with those males in favor of being "neighbory".



Anolis sagrei lizard, Bahamas

Canada

One of the more unusual research destinations for CTR is western Canada. Many of the birds that breed there migrate to the tropics for the non-breeding season. CTR



Yellow warbler, Canada

researchers are studying patterns of migratory connectivity - where specific breeding populations spend their winter - to better understand the threats that certain populations face in their breeding or wintering areas, or along the migratory routes in between. Western Canada is a particularly interesting region because many bird species there have "migratory divides," places where different groups within one species use very different migratory routes. Birds that breed along



Team of CTR graduate students doing research in Canada

coastal British Columbia tend to migrate down the West Coast of North America, while interior birds tend to migrate across eastern North America and across the Gulf of Mexico.

From late June to early August, four CTR researchers traveled from Vancouver, British Columbia, to Calgary, Alberta, studying birds such as common yellowthroats, yellow warblers, hermit thrushes, and Wilson's warblers. The research team consisted of postdoctoral researcher Darren Irwin, graduate students Allison Alvarado and Heather Hough, laboratory manager Jessica Irwin, and Kristen Ruegg, graduate student at the Museum of Vertebrate Zoology, UC Berkeley. The team captured and banded large numbers of migratory birds and collected morphological measurements and blood samples for genetic research.

Uganda

A CTR field team comprised of postdoctoral researcher Ravinder Sehgal, graduate student Adam Freedman, CTR Director Tom Smith, and new CTR collaborator Dr. Gediminas Valkiunas, from Vilnius University Institute of Ecology, Lithuania spent the month of July doing research in Uganda on the infectious diseases of birds. Mist-netting birds in Kibale, Queen Elizabeth, and Bwindi National Parks, the researchers focused on



Little greenbul caught in a mist net, Uganda

understanding why some avian parasites, such as malaria, infect many species of birds, and some are restricted to a single species.

The team was successful in obtaining blood samples from a wide variety of species, including target species that have been the focus of several years of study by members of CTR. In addition, they collected blood samples from domestic chickens in villages surrounding the protected forests in order to determine whether diseases spread from the forest birds to chickens, or vice versa. Another goal of the study was to determine the prevalence of West Nile Virus in the birds of Uganda. West Nile Virus was first described in Uganda in 1937, and has now spread around the world, causing disease in birds, horses, and humans. The field data collected will be linked with land cover data obtained from satellite imagery, with the



Tom Smith, CTR Director, and Gediminas Valkiunas, CTR Senior Research Fellow, testing chickens in Ugandan village

FIELD NOTES *(Continued)*

assistance of CTR Senior Research Fellow Sassan Saatchi at NASA's Jet Propulsion Laboratory.

Field member Adam Freedman also collected data on forest structure and composition along six transects spanning the savanna-forest ecotone in Kibale and Queen Elizabeth National Parks. These data will be related to satellite imagery to examine forest structure changes at the ecotone on a continental scale over the last 20 years in response to both climate change and anthropogenic disturbance.

Mexico

CTR graduate student John McCormack conducted research in the Sierra del Carmen in Coahuila, Mexico on Mexican Jays. McCormack is studying patterns of divergence along an elevational gradient. Results suggest that jay bills in the highlands are smaller, which probably helps high jays pluck pine seeds from their cones, while low jays need larger bills to crack and husk acorns.

The Sierra del Carmen is owned by Cementos de México (CEMEX) and is run as a biological reserve. It is a rare example of a private company taking direct action in preserving land, and will provide a case study



Mexican Jay

for future conservation plans. McCormack returned to the Sierra del Carmen in September and October to continue his work and to collect data on vocalizations and feeding behavior.

Guatemala, U.S., and Ecuador

Borja Milá logged thousands of miles this summer, visiting Guatemala, Washington, and Maine to study the genetic, morphological, and vocal differentiation between migratory and sedentary populations of yellow-rumped warblers and chipping sparrows.

Although much is known about migrants that breed in the U.S. and winter in Mexico and northern Central America, much less is known about the sedentary or non-migratory subspecies that inhabit the highlands of Mexico and Guatemala.

After a pilot expedition to Guatemala in 2001, Milá returned last May for a longer period to increase his sample size. Traveling to the province of Huehuetenango with his Guatemalan colleague Miguel Ramírez, to a reserve at an elevation of more than eleven thousand feet, they were able to obtain blood samples, morphological measurements, song recordings, and natural history information on the local subspecies of the yellow-rumped warbler, the striking Goldman's warbler. In the tropical lowlands of



Goldman's warbler, Guatemala

the Peten, they were able to capture a good sample of chipping sparrows from the Finca Ixobel, a private reserve, as well as other interesting species like Grace's warbler, scrub euphonia, and blue-headed hummingbird.

Milá then traveled to the other end of his species' range in the Cascade Mountains of



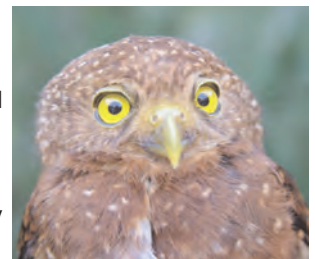
Setting up mist nets in Guatemala



John Pollinger weighing a bird in Ecuadorian rainforest

Washington and in the forests of Maine. Working in collaboration with banders from the Institute of Bird Populations who were operating mist-netting stations as part of the Monitoring Avian Productivity and Survivorship (MAPS) program, he was able to obtain samples from migratory chipping sparrows at both sites, as well as Audubon's warblers in Washington and myrtle warblers in Maine. This sampling of the migratory populations will complement the feather samples that dozens of MAPS banders have been contributing to the CTR genetic sample collection.

In August Milá traveled to the rainforests of Ecuador to study the patterns of population differentiation in the wedge-billed woodcreeper. In collaboration with CTR biologists Jaime Chaves and Drs. John Pollinger and Jordan Karubian, he sampled "wedgie" populations in the lush western lowland rainforests and in the foothill forests of the Andes. To date, the study has found that strong morphological differentiation had



Rare cloud forest pygmy owl, Ecuador

occurred between the lowland and foothill populations despite high levels of gene flow. This information, along with data on other bird, reptile, and small mammal species, is being used to develop conservation priorities for Ecuador.

UCLA International Institute Funds Research Station in Cameroon



The UCLA International Institute awarded a Global Impact Research Grant for \$101,250 to CTR Director Tom Smith and Allen F. Roberts, Director of the James S. Coleman African Studies Center (ASC), to create an international research node in Cameroon, a region that is globally recognized for its rich biological diversity. This north/south-campus collaboration between the CTR and the African Studies Center is envisioned as the first of many projects designed to develop cross-disciplinary approaches to environmental, cultural, and economic issues confronting Central Africa.

The Cameroon node will recruit and train promising students from Central Africa at UCLA, as well as provide opportunities for UCLA students to do field training in Cameroon, with a goal of ultimately establishing coordinated degree programs at UCLA in African and Environmental Studies. Efforts are also under way to raise matching funds and individual contributions to maintain a permanent UCLA research station in Cameroon with a full-time administrator assisted by Cameroonian staff.

The Cameroon node's first interdisciplinary study will focus on the hunting of wildlife for bushmeat in the Dja-Minkebe-Odzala Tri-National Forest, a vast rainforest area in Cameroon, Gabon, and the Republic of Congo. Hunting wildlife for food poses a major threat to biodiversity since approximately 80% of rainforest tree species require animals to disperse their seeds. Some 8,000 endangered great apes, in addition to tens of thousands of monkeys and antelope, are killed each year for food, both for local consumption and by commercial hunters who sell the meat to

consumers in major African cities. It is estimated that the annual harvest of bushmeat in central African tropical forests is between 1-4 million tons.

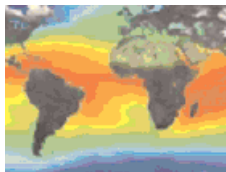


Bushmeat (monkey and duiker) for sale by roadside in Cameroon
Photos courtesy of Debra Pires

The study will examine the hunting of wildlife for bushmeat from ecological, ethnographic, and ultimately socio-economic perspectives, and will design a multi-year research and management action plan (in collaboration with relevant government and non-governmental agencies), organize an international conference on bushmeat to be held in Yaoundé, Cameroon, and publish the conclusions of the study.

CTR Receives NASA Interdisciplinary Science Award

In October 2003 CTR was awarded a three-year grant for \$1.2 million from NASA's Earth Science Enterprise (ESE)



Interdisciplinary Science Program. The objective of the research proposal, entitled "Quantifying Patterns of Biodiversity in a

Changing Climate," is to combine biological data with satellite measurements of the environment to define both the richness and vulnerability of natural habitats, as well as to develop a model that can integrate these data to quantify patterns of species range and diversity.

The research project will focus on tropical

regions of South America and Central Africa and will include scientists from NASA's Jet Propulsion Laboratory in Pasadena, UCLA, Boston University, and State University of New York at Stony Brook. The grant will help CTR to extend its research activities in conservation science by studying the impacts of climate change and human activities on the diversity and sustainability of natural habitats.

The Long-wattled Umbrellabird *(Continued from page 3)*

its research efforts in the Chocó beyond purely scientific approaches by developing collaborative projects focused on economically and ecologically sustainable sources of livelihood for the local population. To better understand the socioeconomic forces driving deforestation and habitat degradation, I have been conducting a series of interviews with local residents.

In addition to my continuing studies of the long-wattled umbrellabird, the CTR research node in Ecuador is engaged in several other projects in the Ecuadorian Chocó. One project, in collaboration with the Missouri Botanical Garden and the

Ecuadorian National Herbarium, is the first to document basic phenology (the timing and extent of fruit and flower production) in primary Chocó forest. Another project records the abundance and diversity of



Male Umbrellabird

more than 80 species of fruit-eating birds in relation to habitat quality, fruit production, and season. Working with Dr. David Romo of Universidad San Francisco de Quito and

with Fundacion Jatun Sacha, we have begun one of the first long-term, standardized sampling projects of reptiles and amphibians in the zone. Amy Rogers, a Ph.D. candidate at UCLA, is conducting thesis research on reforestation and carbon sequestration in the Chocó. Establishing an in-country presence with strong partnerships with local collaborators from a range of disciplines and institutions allows us to embark on long-term research and conservation projects that can have a far-reaching impact while training young scientists from both the U.S. and Ecuador.

Jordan Karubian, 2003
CTR Latin America Director



UCLA Conservation Genetics Resource Center

Center for Tropical Research
and
Department of Organismic Biology, Ecology, and Evolution
University of California, Los Angeles

MISSION

The mission of the Conservation Genetics Resource Center (CGRC) is to provide expertise, resources and sample repository facilities for the generation and analysis of molecular genetic data for wildlife conservation applications.

BACKGROUND

Molecular genetic data have become an essential tool in biodiversity conservation and management. Natural resource managers and decision makers now rely on molecular genetic approaches to obtain essential information such as measures of genetic variability in threatened populations, patterns of gene flow in fragmented populations, migratory patterns in birds, and paternity and relatedness analysis in wild and captive populations. The CGRC provides agencies and organizations with the necessary facilities and expertise to address pressing conservation research questions that require the generation and analysis of molecular genetic data and also provides facilities for the long-term storage of genetic material.



EXAMPLE APPLICATIONS

- Genetic variability of threatened populations
- Population connectivity of migratory birds and mammals
- Population genetic structure and gene flow
- Genetic effects of habitat fragmentation
- Population connectivity in migratory animals
- Density and home-range estimation from non-invasive samples
- Hybridization and introgression analysis
- Paternity and relatedness in captive populations
- Sex determination using molecular markers
- Wildlife forensics
- Storage of genetic samples for time-series analyses



CGRC RESOURCES AND EXPERTISE

The CGRC provides four key research resources:

- *Laboratory facilities and expertise to conduct all aspects of DNA extraction, sample preparation, characterization and analysis.*
 - Isolation facilities for DNA extraction from a variety of biological samples
 - Ancient DNA/degraded sample processing and handling
 - DNA quantification (RT-PCR)-PCR-based tests and DNA amplification
 - State-of-the-art DNA sequencing and genotyping equipment
- *Expertise in all aspects of study design, characterization and analysis of molecular data for conservation applications.*
 - Complete computational facilities and software for data analysis
- *Long-term repository of genetic samples.*
 - Curation and storage of genetic materials (tissue, blood, feathers, hair, feces, etc.)
 - Ultra-freeze (-80°C) storage equipment
 - Fully computerized database
- *Training and education in all aspects of DNA characterization and analysis.*

MOLECULAR MARKERS

- Mitochondrial DNA sequence
- Microsatellites
- Nuclear introns and exons
- MHC polymorphisms
- Sex-linked markers
- Amplified Fragment Length Polymorphisms (AFLPs)
- Restriction Fragment Length Polymorphisms (RFLPs)

THE CGRC IS A RESOURCE FOR:

- Federal wildlife management, environmental, and natural resource agencies and their researchers (UCLA is part of the University of California Cooperative Ecosystem Studies Unit - CESU, which provides for streamlined grant administration by federal agencies and a low overhead rate at UCLA)
- State wildlife management, environmental and natural resource agencies
- U.S. and international academic institutions
- Non-governmental conservation and research organizations

For further information on the CGRC contact:

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Mission and Objectives



Forest Landscape at Hollin (1200m)
in the Andean foothills of Ecuador

The unifying goal of the senior scientists, graduate students, and staff of the Center for Tropical Research is to understand the biotic processes that underlie and maintain the diversity of life worldwide, especially of the tropics, and to use this knowledge to address global environmental challenges. In collaboration with a network of prominent scientists from a diversity of disciplines and backgrounds, we are conducting research in many critical areas including: the processes important in generating diversity in rainforests, the relationship between ecology and disease, migratory connectivity and conservation of migratory birds, and rainforest restoration in human-dominated landscapes. Employing novel applications of the latest technologies, ranging from satellite imagery to molecular genetics, CTR projects provide important training opportunities for young scientists and decision makers from the many countries where our research is conducted. This includes tropical developing countries in Central America, South America, Austral-Asia, and West Africa.

Photos for this issue of the CTR Newsletter were contributed by:

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Institute of the Environment (UCLA)

Institute for Bird Populations

Jatun Sacha Foundation, Ecuador

Organismic Biology, Ecology, and Evolution (UCLA)

Point Reyes Bird Observatory

Reef Check (UCLA)

The Nature Conservancy

Universidad San Francisco de Quito, Ecuador

Wildlife Conservation Society

World Resources Institute

Terra Peninsular

For more information on CTR, its research projects, outreach efforts, events, faculty, and staff, visit us at <http://www.ioe.ucla.edu/ctr>
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