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The Seed

Bi-annual newsletter of the Center for Tropical Research

CTR research sites around the world

LETTER FROM THE DIRECTOR

Dear Readers,

Our last issue of *The Seed* highlighted the projects of the graduate students and postdoctoral researchers of the Center for Tropical Research (CTR) in the Bahamas, Canada, Uganda, Mexico, Guatemala, and Ecuador and described several new initiatives. If you missed it, you can read it online at http://www.ioe.ucla.edu/CTR/publications.htm.

In this issue we feature the research of four UCLA Affiliated Faculty of CTR who have traveled to the tropical forests of Panama, Costa Rica, China, and Madagascar to pursue their varied studies. One of CTR's goals is to bring together scientists from diverse disciplines - in this case, biology, geography, and archaeology - to better understand the processes that underlie and maintain the diversity of life worldwide and to develop cross-disciplinary approaches to solving environmental problems, particularly in the tropics.

We have included a feature by Professor Philip Rundel about his studies of the ecological significance and life history traits of broad-leaved tropical herbs at the La Selva Biological Station, an ecological research facility in Costa Rica operated by the Organization for Tropical Studies (OTS).

In other news, CTR is continuing its campaign to raise matching funds to open an International Research and Training Center in Cameroon, West Africa, a collaborative project with the James S. Coleman African Studies Center at UCLA. We have launched a new project with local Cameroonian and international non-governmental organizations to build a biological research field station in Campo-Mann, a recently established national park in southwestern Cameroon. I visited the park in February to help survey sites for the station and was impressed by the high densities of forest elephants, lowland gorillas, and mandrills. The region is biogeographically unique and comprises an ancient coastal refugium. CTR will help spearhead further surveys of the park this June to finalize the station location.

We welcome contributions to our next issue of *The Seed* which will be published in Fall 2004.

Sincere Regards,

Thomas B. Smith, Ph.D.

In this Issue:

Ginger flower, Costa Rica

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

Research News from CTR Affiliated Faculty

CHINA - Ultrasonic Vocalizations in Frogs and Birds

Several groups of mammals, such as bats, dolphins, and whales, produce ultrasonic signals used for navigation, hunting by means of echolocation, and communication. Ultrasonic vocalizations have not previously been recorded in frogs and birds. The sounds these vertebrates produce are audible to humans and, together with those of insects, are considered the primary sounds of nature.

In a recent study carried out in Anhui Province, central China, we found that an Old World frog (*Amolops tormotus*) and an oscine songbird (*Abroscopus albogularis*) living near noisy streams produce acoustic signals that contain prominent ultrasonic harmonics. Our findings provide the first evidence that anurans and passerines are capable of generating tonal ultrasonic call components and should stimulate the quest for additional ultrasonic species. Whether frogs and birds can perceive ultrasound, and the possible functions of these high-frequency components, are questions for the future. To read more, see Narins, P.M. et al. Old World frog and bird vocalizations contain prominent ultrasonic harmonics. *J. Acoust. Soc. Am.* 2004; 115: 910-913.

Male *Amolops tormotos*

Peter Narins, Professor of Physiological Science and Organismic Biology, Ecology, and Evolution, UCLA

PANAMA - Archaelogical Excavations

Located on the north shore of Isla Col n in the Bocas del Toro Archipelago of western Atlantic Panama, Sitio Drago is a 1,000-year-old coastal village consisting of a least 15 low earthen mounds rich in archaeological deposits. Our 2003 excavations at this pre-Columbian beachfront village produced eight radiocarbon dates ranging from 950 to 1150 AD and revealed much about prehistoric habitation, social organization, trade and exchange, environmental exploitation, and the cultural ecology of the region.

The 2003 project revolved around an Institute for Tropical Ecology and Conservation field class (for more details see newsletter at http//www.itec-edu.org). Findings included copious ceramics, stone tools, and two carved stone feline heads. Food remains found included carbonized seeds and fruit/nut fragments and numerous shells and bones. Invertebrate remains include reef, sandy beach, and mangrove-dwelling mollusk species. Fish dominated the numerous and well-preserved vertebrate remains with at least 38 families identified, including reef, pelagic, and mangrove species. We found evidence of reptiles, primarily sea turtles, amphibians, forest mammals, primarily agouti and paca, along with several other species, including collared peccary, white-tailed deer, three-toed sloth, armadillo, spider monkey, howler monkey, and manatee.

The large and diverse Sitio Drago stands to change interpretations of pre-Columbian society in Bocas del Toro, suggesting that past society in the area was more complex than previously described.

Thomas A. Wake, Director, Zooarchaeology Laboratory, The Cotsen Institute of Archaeology at UCLA

Sitio Drago beach

MADAGASCAR - Ecology and Socioeconomic Projects

In September 2003, Richard Rosomoff and I visited Madagascar, one of eight global biodiversity hotspots. The island is rich in biodiversity and 90% of its 12,000 species are endemic. Of its estimated 7,000 species of vertebrates, there is 50% endemism in birds and 98% in amphibians, reptiles, and mammals. The eastern region of the country is the area most threatened with deforestation and endemic species loss.

We visited a proposed ecological corridor that links two national parks, the Andringitra ecological reserve and the Ranomafana lemur sanctuary. The ecological corridor is the focus of efforts by the World Wildlife Fund (WWF) to distribute ecotourism benefits to local people living near the parks to prevent additional forest fragmentation. Development projects are focused on reducing the expansion of slash-and-burn farming by improving farming practices and developing higher yielding varieties, introducing new cash crops, and diversifying rural production.

The needs of the corridor's human population depend on transporting goods to market and maintenance of the narrow-gauge railroad linking the corridor to coastal ports is crucial since cyclones routinely wash out the roads. The success of these socioeconomic projects is directly linked to efforts to halt deforestation, encourage conservation, and ensure survival of endemic species of plants and animals. This preliminary survey lays the foundation for future conservation and sustainable development work by CTR associates in Madagascar.

Judith Carney, Professor of Geography, UCLA

Agricultural diversification: potatoes and taro in off-season rice fields

Broad-leaved Tropical Herbs in Costa Rica s Rainforest

Broad-leaved monocot herbs are widespread and significant ecological components of the heavily-shaded understories of wet tropical forests throughout the world. They are tall herbs, usually 3-5 feet in height, and characteristically have large showy flowers. Familiar examples of this group of species include many cut flowers from tropical nurseries, such as anthuriums, gingers, heliconias, and calatheas, as well as species such as philodendrons and spathiphyllums that have been "tamed" as houseplants because of their ability to survive well under low indoor light conditions. The characteristic families that comprise the great majority of these understory monocot herbs are the same in both the New World and Old World tropics. These are the Araceae, Costaceae, Heliconiaceae, Marantaceae, and Zingiberaceae.

Heliconia wagneriana

These lineages of tropical herbs are all highly successful ecologically, as well as evolutionarily, in the sense that they are rich in species. The aroid family (Araceae) comprises nearly 3,000 species, with remarkable levels of speciation in two genera restricted to the Neotropics: *Anthurium*, with more than 800 species, and *Philodendron* with more than 500 species. The ginger family (Zingiberaceae), with its diversity centered in the Old World Tropics, includes more than 1,200 species.

Despite their abundance and widespread dominance in wet tropical forests, relatively little attention has been given to the ecological significance and life history traits of

Bridge at La Selva

these broad-leaved monocot herbs. The objective of our project has been to identify the significance of broad-leaved monocot herbs in the floras and communities of lowland wet tropical forests using a variety of field and laboratory approaches, including long-term demographic monitoring, experimental growth studies under controlled conditions, field manipulations of plant biomass, and ecophysiological measurements of photosynthetic responses to variations in light environment and nutrient availability. We are comparing these measurements of the shaded understory herbs to parallel measurements made on related species of herbs growing in high light environments at the edge of the rainforest or in cleared areas. In this way we can separate the relative significance of environmental acclimation versus genetic canalization in the adaptive responses of the species and genera. The title of our program is *Environmental Leaf Monitoring: Understory, Disturbed Sites and Openings* (EL MUNDO).

Our studies are centered at the La Selva Biological Station, an ecological research facility in Costa Rica operated by the Organization for Tropical Studies (OTS). OTS is an international consortium of more than 60 universities and research centers, with UCLA as one of the founding members. La Selva has been an active field station for more than 30 years and, together with the Smithsonian Institution's Barro Colorado Island in Panama, is one of the two most thoroughly-studied rainforest sites in the world. La Selva receives an average of more than 4 meters (13 feet) of rain annually!

Calathea lutea

Collaborators on the EL MUNDO project include Jennifer Sun, UCLA master's student, Kathy Gerst, UCLA alumnus, Drs. Rasoul Sharifi and Art Gibson, UCLA Department of Organismic Biology, Ecology, and Evolution, Dr. Alex Reich of the Claremont Colleges Joint Science Program, Arielle Cooley, a graduate student at Duke University, and Mauricio GaitÆn,a Costa Rican field assistant.

Philip Rundel, Professor of Organismic Biology, Ecology, and Evolution, UCLA

Red-eyed treefrog perched on *Heliconia imbricata*

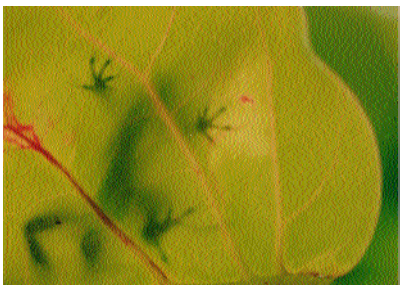
Costa Rica photos courtesy of Jennifer Sun

CTR PUBLISHES ARTICLE

Nature on island evolution

In an article published Thursday, Dec. 4, 2003 in the journal *Nature*, CTR post-doctoral fellow Ryan Calsbeek and CTR Director Tom Smith reported that lizards long thought to be evolving independently on Caribbean islands in fact exchange genetic material. According to their 12-month study, hurricanes and lesser storms wash the lizards into prevailing ocean currents which carry them from island to island. The study questions the widely held view thatvast numbers of species of plants and animals on Caribbean, Hawaiian, and Galapagos islands evolved separately in isolated microcosms of evolution. The research sheds new light on the mechanisms of evolution of animals in island habitats and their future ability to adapt. You can read the full article at www.ioe.ucla.edu/ctr/staff/calsbeek/index.html

Anolis lizard



Shadow of *Anolis* lizard, Bahamas

Tom Smith and Victoria Sork to teach new UCLA course, Conservation of Biodiversity

Professors Tom Smith and Victoria Sork will be teaching Environment 121, Conservation of Biodiversity, a new undergraduate course offered by the UCLA Institute of the Environment designed to educate students to assess and support effective conservation strategies and policies. The course will provide a basic understanding of the ecological, evolutionary, and genetic principles necessary to understand biological diversity as well as evaluate the current threats to natural habitats around the world.

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