STRI news 2008

Smithsonian Tropical Research Institute, Panamá www.stri.org October 24, 2008

Tupper 4pm seminar

No seminar scheduled for Tuesday, October 28. Check your e-mails for last minute information.

Paleo-Talk

Wednesday, October 29, Paleo-talk speaker will be Surangi Punyasena, STRI, at 4pm, CTPA:
The climatic specialization of Neotropical families

Bambi seminar

Thursday, October 30, Bambi seminar speaker on BCI will be Alex Zimmerman, University of Potsdam
Rainfall redistribution in a tropical forest: spatial patterns and temporal persistence

Arrivals

Alexandra Wright, University of Wisconsin, Milwaukee, to study if lianas cause chronic disturbance and alter successional trajectories in tropical forests, on BCI and Gamboa, and participate in the field course Conservation and Development 2008 at Bocas del Toro.

Shai Pilosof, UNAM, Mexico, to participate in a project on the role of odors for mate choice and social structure in *Noctilio albiventris*, the lesser Bulldog-bat, in Gamboa.

Tiffany Troxler, Florida International University, and Stephen Davis, Texas A&M University, to quantify relationships between resource heterogeneity and plant community structure in a coastal freshwater swamp of Panama, at Bocas.

Diversity of trees in Ecuador's Amazon rainforest defies Neutral Theory

Yasuni plot worker.
Photo: Renato Valencia, PUCE

Trees in a hyper-diverse tropical rainforest interact with each other and their environment to create and maintain diversity, according to a study published by *Science* (October 24) conducted by Nathan Kraft, *et al.* in the Yasuni Forest Dynamics Plot (FDP) of the Pontificia Universidad Católica del Ecuador (PUCE). Yasuni is associated with the Center for Tropical Forest Science/ Smithsonian Institution Global Earth Observatory network (CTFS/SIGEO). See full citation in "New publications"

It is difficult to determine the effects of climate change, habitat fragmentation and species extinctions on life's diversity without a coherent model of how communities are organized, but a unified theory of diversity patterns in ecological communities remains elusive. The most complex biological systems—such as tropical rainforests—are the most important testing grounds for theories that attempt to generalize across ecological communities, as they pose the greatest challenge. The Yasuni, Ecuador FDP is one of the most diverse forests under study by CTFS/SIGEO.

In 2001 STRI's Stephen Hubbell (also with UCLA), proposed a neutral theory of biodiversity based on more than 20 years of data from the original FDP on BCI. The methods that Hubbell and colleagues established were so useful, that other institutions worldwide adopted the same methodologies. The Yasuni plot was established in 1995 by researchers from PUCE, Aarhus University in Denmark and STRI.

"The global reach of the CTFS/SIGEO forest monitoring network, and the power to test theories of biodiversity depend entirely on independently motivated researchers who study trees in places from Yasuni to Papua New Guinea, on the other side of the world," said STRI director Eldredge Bermingham.

Neutral theory rests on the assumption that all species are equal in terms of their ability to survive and reproduce. Chance events drive change. This study supports an alternative, older explanation that characteristics of individual species play an important role in determining the structure of the community, contributing to the maintenance of biodiversity through distinct strategies.

More research will be needed to resolve these conflicting views, and participants in the CTFS/ SIGEO network of more than 30 FDP in 17 countries hope that researchers will take advantage of standardized life-table data from more than 6,500 tree species to understand the patterns of biological diversity across the world.

Departures

Ira Rubinoff to Nassau, Bahamas, to meet with STRI donor.

Steve Paton to Washington DC, to work with the IABIN project and consult with colleagues.

Mark Torchin to Lexington, to speak at a symposium on invasive species at the University of Kentucky, then to Veracruz, Mexico for a research trip to analyze parasitism in marine snails and collect specimens for genetic comparisons.

Carlos Jaramillo to Brazil, to attend the "Congreso Brasilero de Paleobotanica y Palinilogia" in Florianopolis, followed by a field trip in Iguazu, for flora and geologic research.

New publications

Angehr, George R., Engleman, Dodge, and Engleman, Lorna. 2008. *A bird-finding guide to Panama* (2nd ed.). New York: Cornell University Press.

Fincke, Ola M., and Hedstrom, Ingemar. 2008. "Differences in forest use and colonization by Neotropical tree-hole damselflies (Odonata: Pseudostigmatidae): Implications for forest conversion." *Studies on Neotropical Fauna and Environment* 43(1): 35-45.

Hultgren, Kristin M., and Stachowicz, John J. 2008. "Molecular phylogeny of the brachyuran crab superfamily Majoidea indicates close congruence with trees based on larval morphology." *Molecular Phylogenetics and Evolution* 48(3): 986-996.

Anopheles darlingi found in Panama

Anopheles darlingi is the most efficient vector of human malaria in America. It has a wide geographical distribution range, from all of South America to countries in North and Central America including Mexico, Guatemala and Belize.

However, the mosquito was never found before in Nicaragua, Costa Rica nor Panama, showing an interrupted distribution overlapping *Plasmodium falciparum*, responsible for taking the most lives due to cerebral malaria on the planet.

A. darlingi transmits more than 560,000 malaria cases per year in America. Millions of dollars are invested annually to its study and control especially in Brazil, Peru and Venezuela, where malaria prevails the most. *A. darlingi* feeds mainly from human blood at night avidly attacking people while resting. Possessing a marked longevity, they easily infect with *Plasmodium vivax* and *Plasmodium falciparum*.

Currently, *A. darlingi* is thought to be going through a process of speciation since two different genotypes were found distributed in the Americas. The species shows a marked morphological and behavioral variation in their biting, resting, seasonality and resistance to insecticide.

The larvae of this species grow by river and spring banks, bamboo roots, emergent vegetation offering protection against predators. *A. darlingi* has also shown to be very opportunistic invading man made lagoons like those of hydroelectric projects, irrigation channels, rice fields and still pools of water.

Malaria has powerfully re-emerged during the past 15 years in Brazil and Peru due to deforestation of primary habitats. *A. darlingi* has increased expanding density and geographical distribution towards more populated and urban regions resulting with the reappearance of *P. falciparum*, the protozoan parasite accounting for 80% of all human malarial infections and 90% of the deaths.

Specimens of *Anopheles darlingi* were collected in Darien biting people between 6 and 10pm in Jaqué and Biroquera, near the Colombian border. This finding was conducted by members of the STRI project "Taxonomic state, genetic structure and demographic history of malaria vector (*Anopheles punctimacula*) in Panama based on mitochondrial and nuclear DNA analysis." The project´s principal investigator is José Loaiza, PhD candidate of STRI-McGill NEO program. The specimens were visually identified and taken to STRI Molecular Laboratories at Naos. Seventy tree specimens from Biroquera and three from Jaqué were confirmed to be *Anopheles darlingi*, using molecular technology.

Historically, both San Blas and Darien have been endemic for *P. falciparum* , showing strains with high resistance to drugs used to treat malaria. Ninety cases of malaria were reported last year in Puerto Piña, near Jaqué. Even though was not identified as responsible for the episode, it may have been the cause to this and other events reported earlier.

The presence of *Anopheles darlingi* in Darién confirms that this region poses extreme epidemiology importance. Preserving their forests is as important to public health in Darien, as it would be the use of more drastic eradication measures of the mosquito.

According to a report published in the January 2006 issue of the *American Journal of Tropical Medicine and Hygiene*, the researchers found that in the

New publications

Kraft, Nathan J. B., Valencia, Renato, and Ackerly, David D. 2008. "Functional traits and niche-based tree community assembly in an Amazonian forest." *Science* 322(5901): 580-582.

Krisky, Delane C., and Mendoza-Franco, Edgar F. 2008. "Revision of *Aristocleidus* (Monogenoidea: Dactylogyridae), rediscovery of *Aristocleidus hastatus*, and description of *Aristocleidus lamothei* n. sp. from the Peruvian Mojarra *Diapterus peruvianus* (Teleostei: Gerreidae) in Mexico " *Revista Mexicana de Biodiversidad* 79: 75S-82S.

Mendoza-Franco, Edgar F., Roche, Dominique G., and Torchin, Mark E. 2008. "New species of *Diplectanum* (Monogenoidea: Diplectanidae), and proposal of a new genus of the Dactylogyridae from the gills of gerreid fishes (Teleostei) from Mexico and Panama." *Folia Parasitologica* 55: 171-179.

Mueller, Ulrich G., Dash, Debadutta, Rabeling, Christian, and Rodrigues, Andre. 2008. "Coevolution between attine ants and actinomycete bacteria: a reevaluation." *Evolution* Online.

Vidal Martinez, Victor M., and Mendoza-Franco, Edgar F. 2008. "*Heterobothrium lamothei* n. sp. (Monogenea: Diclidophoridae) from the gills of *Sphoeroides testudineus* (Pisces: Tetraodontidae) from the coast of Yucatán, Mexico." *Revista Mexicana de Biodiversidad* 79: 89S-93S.

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most deforested areas the biting rate of the mosquito *Anopheles darlingi* "was more than 278 times higher than the rate determined for areas that were predominantly forested." The mosquitoes prefer to live in open, sunlit pools of water, which are more prevalent in deforested areas. "In this case, conservation policy and public health policy are one and the same" commented one of the authors of the article to *The Washington Post* in a review by Juliet Eilperin "Mosquito bites more likely in deforested Amazon areas."

With information and photo from José Loaiza, *The Washington Post, &* Vittor, *et al.* 2006. *Am. J. Trop Med. Hyg.* 74: 3-11.

Anopheles darlingi es el vector más eficiente de la malaria humana en América. Tiene un amplio rango de distribución geográfica desde toda Suramérica hasta países en Norte y Centroamérica incluyendo México, Guatemala y Belice.

Sin embargo, el mosquito nunca se había encontrado en Nicaragua, Costa Rica ni Panamá; lo que muestra una distribución interrumpida que traslapa geográficamente con *Plasmodium falciparum*, responsable por acabar con más vidas debido a malaria cerebral, en el planeta.

A. darlingi transmite más de 560,000 casos de malaria por año en América. Millones de dólares se invierten anualmente para su estudio y control, principalmente en Brasil, Perú y Venezuela donde la malaria se ha mantenido. *A. darlingi* se alimenta principalmente de sangre humana de noche, atacando ávidamente a las personas mientras duermen. Al poseer un marcada longevidad, transmiten fácilmente el *Plasmodium vivax* y *Plasmodium falciparum*.

Actualmente se cree que *A. darlingi* atraviesa por un proceso de especiación ya que se han encontrado dos genotipos distintos distribuidos en las Américas. La especie posee una marcada variación morfológica y de conducta en sus hábitos de picadura, reposo, estacionalidad y resistencia a insecticidas.

Las larvas de esta especie de mosquito se crían en las orillas de ríos y quebradas, en raíces de bambú y vegetación emergente que ofrecen protección contra depredadores. *A. darlingi* ha mostrado también ser altamente oportunista, al invadir lagos hechos por el hombre como lagunas en proyectos hidroeléctricos, canales de irrigación, campos de arroz y depósitos de agua.

La malaria ha re-emergido poderosamente durante los últimos 15 años en Brasil y Perú debido a la deforestación del hábitat primario. *A. darlingi* ha aumentado su densidad y expandido su distribución geográfica hacia zonas de mayor población y regiones urbanas resultando en la reaparición de *P. falciparum,* el parásito protozoario responsable por el 80% de las infecciones de malaria y el 90% de las muertes por esta enfermedad.

Epecímenes de *Anopheles darlingi* fueron colectados por primera vez en Darién picando personas entre las 6 y 10 pm en Jaqué y Biroquera cerca de la frontera con Colombia. El hallazgo fue realizado por miembros del proyecto de STRI "Estado taxonómico, estructura genética e historia demográfica del vector de la malaria (*Anopheles punctimaculata*) en Panamá basado en análisis de ADN nuclear y de la mitocondria." El investigador principal del proyecto es José Loaiza, candidato a doctorado del programa NEO de STRI y McGill University. Los especímenes fueron identificados tentativamente y llevados a los Laboratorios Moleculares de STRI en Naos.

Setenta y tres especímenes de Biroquera y tres de Jaqué fueron confirmados como *Anopheles darlingi* a través de técnicas moleculares.

Históricamente, tanto San Blas como Darién han sido zonas endémicas de *P. falciparum*, que muestra cepas con una marcada resistencia a los medicamentos utilizados para tratar la malaria. Noventa casos fueron registrados el año pasado en Puerto Piña cerca de Jaqué. Aunque *A. darlingi* no fue identificado como el responsable de este episodio, bien pudo haber sido la causa de este y otros eventos reportados anteriormente en esta área.

La presencia de *Anopheles darlingi* en Darién confirma que esta región presenta una extrema importancia epidemiológica. Conservar sus bosques es tan importante para la salud pública de Darién como lo sería el uso de medidas de erradicación drásticas del mosquito.

De acuerdo con un artículo publicado en el número de enero de 2006 de la *American Journal of Tropical Medicine and Hygiene*, un grupo de investigadores encontraron que en las áreas más deforestadas la tasa de picaduras del mosquito *Anopheles darlingi* "fue de 278 veces mayor que la tasa de picaduras en áreas predominantemente boscosas." Los mosquitos prefieren vivir en depósitos de agua abiertos y asoleados, que se encuentran más en las áreas deforestadas. "En este caso, las políticas de conservación y las políticas de salud pública son una y la misma" comentó uno de los autores del artículo a *The Washington Post* en una reseña por Juliet Eilperin, "Picaduras de mosquitos son más frecuentes en áreas deforestadas del Amazonas."

Con información y foto de José Loaiza *The Washington Post* Vittor, et al. 2006. *Am. J. Trop. Med. Hyg* 74: 3-11


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