

Smithsonian Tropical Research Institute
Weekly Update and Forecast
May 30, 2004

Scientific excellence



Soils and Hydrology Workshop participants on Barro Colorado Island plan sampling strategies to unearth secrets of tropical soils in all 17 Center for Tropical Studies sites around the globe (See May 24 Weekly for more information). Photo: Christina Gomez-Mira

Peer reviewed publications

Lianas evident in dry forest photos

Lianas, tropical vines, take advantage of trees in the competition for light. They put most of their biomass into leaves rather than wood and use tree branches and trunks for support. Recent studies suggest lianas are taking over tropical forests, and may be changing tree species composition as they shade out and weigh down trees.

Of course, it's challenging to study the effect of lianas on forest dynamics from the ground: remote sensing techniques may help, but only if lianas are distinguishable from the surrounding forest canopy in aerial photos and satellite images.

Researchers from the Earth Observations Systems Laboratory at the University of Alberta, Edmonton, photographed lianas from STRI's canopy cranes in the dry forest on Panama's

Pacific slope and in the evergreen forest near Panama's Atlantic coast, during the dry season.

At the dry forest site, they could clearly distinguish the spectral properties of lianas, whereas, in evergreen forest, tree canopies and lianas were indistinguishable.

Lianas...

The team hopes that further research will help to clarify what physiological mechanisms determine the differences they observed between trees and lianas at the dry forest site, and whether these differences hold up during the rainy season.

Ref: Castro-Esau, K.L., Sanchez-Azofeifa, G.A. and T. Caelli. 2004. Discrimination of lianas and trees with leaf-level hyperspectral data. *Remote Sensing of Environment* 90:353-372. Castro-Esau, Sanchez and Caelli.pdf



Adenaria floribunda. Photo: Rafael Aizprua, ICBG Staff,

http://www.icbgpanama.org/website/gall_frame.php?galeria=1

Ref: Hussein, A.A., Barberena, I, Capson, T.C., Kursar, T.A., Coley, P.D., Solis, P.N. and Gupta, M.P. 2004. New cytotoxic naphthopyrane derivatives from *Adenaria floribunda*. *Journal of Natural Products* 67:451-453. Hussein, Barberena, Capson, Kursar, Coley, Solis and Gupta.pdf

Baby leaves yield new biomedical compounds

The ecologically informed bioprospecting project in Panama, sponsored by the International Cooperative Biodiversity Group, announces four new active chemical compounds isolated from young leaves collected on Barro Colorado Island

STRI's Sherman Canopy Crane. Photo: Marcos Guerra.



from *Adenaria floribunda*, a plant in the same family as the famous North American invasive species Purple Loosestrife (*Lawsonia inermis*, Lythraceae).

Whereas Purple Loosestrife is widely used for medicinal purposes in its native Eurasia, there were no reported phytochemical studies or ethnomedical claims for *Adenaria floribunda*.

Crude extracts from young leaves kill human cell lines, whereas extracts from mature leaves do not. One of the working hypotheses of the Panama ICBG group is that tender young leaves produce a wide range of chemical defenses, which may be lost in older, tougher leaves. The group focuses their efforts to find new medicinal compounds on fresh young leaf material.

Their strategy paid off in this case. Young leaves yielded four new cytotoxic naphthopyranes. Naphthopyrane compounds can be potent antibiotics, cytotoxins and mutagens. The new compounds were cytotoxic against breast, lung

and central nervous system human cancer cell lines and were named: Adenaflorin A,B,C and D.

What kills leaf cutting ants?

Leaf cutter ant queens live up to 20 years and produce millions of offspring. You would think that huge leaf cutter colonies (up to 20 m across and 7 m deep), where the ants cultivate fungi in underground chambers, would attract insect pathogens. Researchers from the University of Copenhagen, working at STRI facilities in Gamboa, Panama, found deadly, insect-killing fungi to be common in the soil around leaf cutter nests. However, few ants were infected. They conclude that good ant hygiene: self grooming and antibiotic excretions, protect individual ants from fungal infection.

In order to find out more about the nature of one of the common insect killing fungi, *Metarhizium anisopliae* var *anisopliae*, they sequenced the IGS region of 45 Panamanian isolates of this species and compared these sequences with those from other isolates from a gene bank. Most Panamanian isolates belonged to one of three known clades. Within this clade, the Panamanian isolates fell into three sub clades, one of which is based on fungi isolated around a single nest of *Acromyrmex echinator*. Despite the genetic variability of the fungus, ants seem to evade infection.



Atta colombica queen infected by an unknown fungus.
Photo: Greg Dimijian.

Ref: Hughes, W.O.H., Thomsen, L., Eilenberg, J. and Boomsma J.J. 2004. Diversity of entomopathogenic fungi near leaf-cutting ant nests in a neotropical forest, with particular reference to *Metarhizium anisopliae* var *anisopliae*. *Journal of Invertebrate Pathology* 85: 46-53.
Hughes Thomsen Eilenberg and Boomsma.pdf

The Fungus Rules! Leaf cutter ants poop fungal enzymes to break down leaf material for the fungus.

In yet another amazing revelation about the symbiosis between leaf cutting ants and the fungus they cultivate, the folks from the University of Copenhagen who work in Gamboa report that leaf cutter ants may actually concentrate digestive enzymes produced by the fungus in their own guts, and then excrete them out onto the incoming leaf material that will serve as a substrate for the fungus to grow on.

Leaf cutter ant workers leave their underground nests to forage for leaf pieces that they bring back to fertilize their underground fungus garden. When a leaf piece comes into the nest, ants first cut it into smaller pieces, they excrete a small drop of liquid onto the leaf and then they add it to the pile of leaves that the fungus grows on. This study shows that the liquid drop contains digestive enzymes

(carboxymethylcellulases, laccases, proteases and pectinases) produced by the fungus and concentrated in the ant's gut.

Ref: Ronhede, S., Boomsma, J.J. and Rosendahl, S. 2004. Fungal enzymes transferred by leaf-cutting ants in their fungus gardens. 2004. *Mycological Research* 108(1):101-106. Ronhede Boomsma and Rosendahl.pdf

Public impact

Experimentan compuesto Panameno contra leishmaniasis en Londres

(La Prensa, Panama—June 3, 2004)

Panama's ICBG group has now patented a plant extract with activity against the common tropical disease, Leishmaniasis. Animal testing begins in London, to determine if the compound is safe and effective as a treatment.



Sir Christopher Lever climbs with IBISCA team, STRI Sherman Crane site. Photo: Thierry Aubert.

Sir Christopher Lever and Andrew W. Mitchell visit Canopy Project

Sir Christopher Lever, historian and author of a series of natural history books focusing on the introduction of non-native vertebrates (like the Cane Toad), visited STRI Staff Scientist Klaus Winter's carbon uptake experiments in Gamboa and the IBISCA Project (Investigating the Biodiversity of Soil and Canopy Arthropods) at the Sherman Crane site. Lever, well connected in the conservation world, is trustee of the Kleinwort Charitable Trust, the Earthwatch Institute and chairman of Tusk, an organization dedicated to conservation of wildlife habitat in Africa. Andrew Mitchell directs the Global Canopy Programme at Oxford.

New publicity for Culebra Marine Exhibition

Center On June 14th all 70 of Panama City's bus stops will display a striking poster inviting the public to visit Culebra Point Marine Exhibition Center. This massive campaign has been possible thanks to an in-kind contribution from Equipamientos Urbanos, the company that

constructs and maintains the bus stops. It is estimated some 500,000 commuters in the City will see these advertisements daily.

Vist from Panama's National University in Changuinola

A group from Panama's Universidad Nacional de Changuinola visited STRI's facilities in Bocas on May 29. They would like to establish a formal relationship with STRI so that their students could participate in our research efforts.

Vernier sensors featured in JASON expedition to Panama

(The Caliper, Spring, 2004)

This trade magazine features the use of Vernier sensors by JASON students on STRI's Barro Colorado Island in Panama.



Bob Ballard demonstrates Vernier technology with JASON Argonaut.

<http://www.vernier.com/caliper/spring04/panama.html>