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The browning of tropical mountains

Climate warming in recent decades, largely attributed to human activities, is affecting vegetation in tropical mountain regions of the world. Scientists report this from a joint study conducted at ATREE, the Indian Institute of Science Education and Research (IISER) at Kolkata, and CIFOR Indonesia, and published in the journal *Global Change Biology*.

Tropical mountain ecosystems are important for biodiversity and ecosystem services. They are also sentinels of global change, including climate change. Researchers used satellite data from 1982-2006 for tropical mountain regions in five continents ranging from the tropical Andes to the Himalayas and South East Asia. They measured changes in Naturalized Difference Vegetation Index (NDVI), an index of greenness—a measure of photosynthetic activity—and then compared these changes with trends in temperature and rainfall.

The scientists first examined maximum greenness attained at any site in each year on record, which is the maximum foliar biomass attained. They found that tropical mountain forests first became greener with time, and then suddenly reversed to become browner, starting in the mid-1990s, in all tropical mountain regions of the earth. Browning indicates a reduction in photosynthetic activity. During the same period, four of the five regions became

significantly warmer, but rainfall trends were less obvious and patterns were more complicated. They also found that the index of greenness was responding negatively to temperature in some regions, and in regions such as the Himalayas this negative response to warming intensified over the study period.

In the 1990s, other scientists had reported that increased temperatures and reduced input of moisture from decreased frequency of misty days were causing a drought-like conditions in the mountains of Central America. The new findings on vegetation changes suggest that such climate change phenomena may be more widespread in all tropical mountain regions. The scientists also realized that after they had accounted for the effects of temperature and precipitation, there was residual greening and browning evident in these mountain regions, suggesting that other regional and global environmental changes such as pollution, aerosols, nutrient deposition or increased photosynthetic activity due to enhanced CO₂ could be driving vegetation response in tropical mountains.

The research paper cautions, “*The decline of biodiversity in species-rich mountain ecosystems could have adverse impacts on ecosystem function and decrease ecosystem services on which millions of people are dependent.*” Mountain ecosystems, known to be particularly ecologically sensitive and vulnerable to climate change, should be placed in “*high priority in global conservation strategies,*” it adds.

*Jagdish Krishnaswamy, Convenor,
Suri Sehgal Centre for Biodiversity
and Conservation*

News from the eighth continent

The canopy, which was the last frontier—after space—to be crossed, is sometimes referred to as the ‘eighth continent’. Safer techniques to access the heights (developed in the 1970s) resulted in accelerated research, but the discoveries are still coming in, and not in trickles. Combine this with the current rate of deforestation, and the urgency in stepping up our understanding of the canopy ecosystem and its relation to biophysical processes, biodiversity and human kind becomes obvious. In this scenario, we have a new book on canopy science, which urges new and innovative approaches to comprehend the role of canopy systems.

ATREE’s resident canopy team of Soubadra Devy and T Ganesh, and canopy expert Meg Lowman have released a compilation of research insights, findings and discourses presented at the 5th International Canopy Conference at Bengaluru in 2009. The edited book, *Treetops at Risk*, contains some of the latest science on canopy studies by the world’s leading experts on canopies.

Treetops at Risk raises as many questions as it attempts to answer in sections on emerging issues; climate

change; new approaches; education and outreach; and ecosystem, services and sustainability. It is a relevant book because, first, canopy science is still relatively young, and two, because of the rate at which we are losing forests/canopies in developing and developed countries.

More...

More news on how canopies matter, even in their sparser forms, as windbreaks in tea plantations, is the subject of a new paper. The paper presents findings on the role of windbreaks in tea plantations—how they improve connectivity to plantation-edge primary forests, and thereby contribute to/ influence bird species richness and community composition. What is remarkable is that this paper has been written by undergraduate students who were part of ATREE’s conservation biology certificate course in 2010. The students, guided by ATREE PhD student, Vivek Ramachandran, persevered through time and peer reviews to finally be published in *PLoS ONE*, a peer reviewed journal on science. To be published in *PLoS ONE* while an undergraduate is quite an achievement and the team is proud of the authors. Sreekar R, Mohan A, Das S, Agarwal P, Vivek R. 2013. Natural windbreaks sustain bird diversity in a tea-dominated landscape. *PLoS ONE* 8(7): e70379. doi:10.1371/journal.pone.0070379



Personal takes

Personal takes is a new column on first person accounts, experiences and opinions by people who do research. Prepare to meet natural and social scientists outside of their published works: in the field, in class, in the Forest Department's office, at home. Find out what they think, who they are and why they do the work they do.

Angling: is it good or bad?

Vidyadhar Atkore, PhD batch 2009, attended a workshop on Western Ghats Freshwater Fish Conservation: Strategy and Action in August, in Kochi, Kerala. Vidyadhar expresses his views on angling, shared with other delegates.

'On ethical grounds, I strongly feel, angling should not be allowed for the following reasons: there are no standard protocols for guiding anglers on catching fish for sport; there are no guidelines for type and size of fish caught; no guidelines for appropriate size of bait or hooks.

*Even for fish that are caught and released, how do we know what kind of post release stress and injuries occur? How do we know whether such sport affects breeding? How does one ensure that gravid females are not caught? The Mahseer is a sport fish because it fights back. But both, the Himalayan (*Tor putitora*) or Deccan mahseer (*Tor khudree*), are also listed as threatened under the IUCN Red List. So given all the*



things we do not know about post catch trauma, does it make sense to target them for angling?

I agree angling generates revenue which, maybe, promotes barefoot conservation efforts. But should we not be thinking of the wellbeing of the animals? Experts from taxonomy, behaviour, ecology, physiology should engage to find wise solutions to the human activity of sport fishing. Perhaps, a few river stretches could be identified merely for 'fish watching'! Learning about fish natural history associated with culture and mythology through images could also aid conservation in a better sense.'

Vidyadhar Atkore

Outreach

World Natural Heritage Sites: experiences and best practices from south Asia

UNESCO New Delhi Office, in association with the Ministry of Environment and Forests, Government of India, organized a two-day Regional Conference on 'Conservation and management of World Natural Heritage Sites: sharing experiences and best practices from south Asia' at India Habitat Centre, New Delhi on 17-18 September, 2013. The conference was held under the aegis of the World Heritage Biodiversity Programme – India (WHBPI) which was implemented as an UNESCO initiative in four World Natural Heritage Sites in India, namely Kaziranga, Manas, Keoladeo and Nanda Devi National Parks during 2008-2013. ATREE was the implementing agency for the two sites of Kaziranga and Manas in Assam.

Policy makers, park managers, academia, practitioners and other relevant stakeholders attended the conference. Representatives from World Natural Heritage Sites in Bangladesh, Bhutan, Nepal, Sri Lanka and India shared experiences and best practices on conservation and management from their sites. ATREE Coordinator from the Guwahati Office, Niraj Kakati presented an overview of the key outcomes and learning from the WHBPI project in Assam, outlining early impacts and sharing thoughts on the lessons derived from the experience of implementing the project over the last five years. ATREE Director, Dr. Ganesan Balachander was an invited member on the panel discussion on '*Strategy for building partnerships and resource mobilization*', where he discussed ideas on tapping new constituencies and alternative sources for raising resources to support projects of this kind. It may be pertinent to mention that Dr. Balachander played a key role on behalf of the Ford Foundation as a primary donor during the inception of the WHBPI Project more than five years ago.

Niraj Kakati, Guwahati

Expert group meeting on water issues in the Noyyal

ATREE and Tamil Nadu Agricultural University co-organized an expert consultation on water management in the Noyyal Basin on 24 September 2013. This was a preliminary activity of the Adapting to Climate Change in Urbanizing Watersheds (ACCUWa) project that proposes to study the response of stakeholders to water vulnerability and accessibility, in urbanizing watersheds, and especially as a result of climate change. The



watersheds identified for this three-year study are the Arkavathy sub-basin in Karnataka, and the Noyyal sub-basin in Tamil Nadu. ACCUWa is supported by International Development Research Centre (IDRC), Canada.

The workshop, held at the Farmer's Residency Seminar Hall at TNAU campus in Coimbatore saw participation from twenty experts representing civil society groups, government agencies and academic institutions working on water-related issues in the region. The ATREE-TNAU team presented an analysis of the current water management situation in the Noyyal basin. The presentations reviewed the current state of knowledge on different dimensions—water scarcity, sustainability, equity and water quality/public health. The discussions, which lasted over three hours, helped clarify a future research agenda for the Noyyal.

Veena Srinivasan, Fellow, Centre for Environment and Development

Grantee outreach: workshops of the CEPF Western Ghats Programme

Foundation for Ecological Research, Advocacy and Learning (FERAL), a CEPF grantee, conducted a workshop on '*Science and practice of linking Periyar–Agasthyamalai landscape for large mammal conservation*' to identify existing barriers and potential threats to connectivity at landscape and regional scale, as well as enumerate the challenges and tradeoffs in maintaining and restoring connectivity. ATREE Regional Implementation Team (RIT) member, R. Ganesan, attended the workshop, held in the first week of August. It was organized by CEPF and FERAL.

RIT Coordination Unit team member Cynthia Sinclair participated in a workshop conducted by a first time grantee, Sahyadari Nisarga Mitra, working on vulture conservation in the Sahyadri-Konkan region of the Western Ghats. This served as a good opportunity for attendees to network with government establishments, the



scientific community, civil society organizations and students, for vulture conservation.

Keeping busy further south, RIT member Priyadarsanan Dharma Rajan attended the Western Ghats Freshwater Fish Conservation Strategy and Action workshop held in mid-August at Kochi. It was organized by Navadarshan Public Charitable Trust (NPCT) as part of its CEPF grant activity. The objective of the workshop was to facilitate interactions between experts from the scientific community on freshwater fish taxonomy, conservation and policy implementation.

Cynthia Sinclair and Bhaskar Acharya, CEPF RIT team

Jalapaadom news

Alappuzha based environmentalist and long-time ATREE partner, KV Dayal, initiated seventy nine students and teachers into the basics of organic farming. He talked of preserving links in the agriculture food chain, of useful 'pests' and 'predators' in the ecosystem, with the help of which it is possible

to farm without chemicals. Mr Dayal gave a tour of his home garden while explaining his experiments in organic farming practices. He also spoke of the various uses of the medicinal plants he was cultivating in his home garden.

Retired Deputy Director in Agriculture Department, Govt. of Kerala, PJ Joseph supported this with more detail on pest management through tricho-cards and Integrated Pest Management; the use of biofertilizers like Rhizobium and Azospirillum, which build up micro-flora and improve soil health, and a DIY demo on how to prepare biofertilizer cultures. The lecture on organic pesticides and weedicides was followed by a documentary tracing the success of a farmer using integrated organic farming methods.

Sixteen schools and five colleges from Alppuzha and Kottayam districts participated in this workshop, held on 24th August. This was a *Jalapaadom* exercise (*Jalapaadom* means 'lessons in water', and is the flagship programme for schools and colleges by ATREE's Vembanad Community Environmental Resource Centre).

A teacher training workshop of the *Jalapaadom* programme for the academic year 2013-2014 was held earlier, on 4 July, at Alappuzha, CERC, ATREE. The group mapped out the year's plan for workshops on recycling, organic farming, waste management, as well as nature camps in wildlife sanctuaries or reserve forests of Kerala, training for research projects by schools that could be showcased in the Students' Wetland Congress, plus other activities on the annual agenda of the programme. Teachers from eighteen schools of Alappuzha and Kottayam districts participated in the workshop.

Jojo TD, Vemabanad

New

Recognitions

Srinivasan, Veena received the 2012 Water Resources Research Editor's Choice Award for paper 'The nature and causes of the global water crisis', American Geophysical Union.

People

Kavya Krishna joined as Research Assistant; **Nikhil Raj**, **Apoorva** and **Kumar D** joined as Research Associates. **Kadambari Anantaraman** Senior Research Fellow in the Land Water Livelihoods team; **Rutuja Dhamale** joined as consultant with **Abi Tamim Vanak's** grasslands team; **Shiv Subramanya** has rejoined as Web and Database Coordinator; **Muneeswaran M** has joined as Project Coordinator in the Ecoinformatics Lab. We also have twelve new students in the 2013 PhD batch: **Soumyajit Bhar**, **Yamini Virginia John**, **Sahiti Sanaka**, **Rahul Muralidharan**, **Ramya Ravi**, **Sony R K**, **Rashmi Mahajan**, **Rashmi Rekha Sharma**, **Ranjeet Kumar Sahani**, **Nachiket Kelkar**, **Hussain Ebrahim**, **Annesha Chowdhury**.

Workshops organized

Abi T. Vanak. Workshop on 'Conservation of semi-arid savanna grasslands and their associated fauna'. Funded by **Suri Sehgal Centre for Biodiversity and Conservation**. SCCS- Bengaluru. 25 Sept 2013.

Ethics in human and animal research. Organized by **Krithi Karanth**, **Abi T. Vanak** and **Kartik Shanker**. SCCS- Bengaluru. 27 Sept 2013.

Vidyadhar Atkore conducted a

workshop on 'Freshwater conservation biology: concepts and techniques' on 25th September at Student Conference on Conservation Science (SCCS)-2013 Bengaluru. The other instructors were **Robin Kurien**, **Tarun Nair**, and **Nachiket Kelkar** (of the 2013 ATREE PhD batch).

Sharad Lele and **Veena Srinivasan** (ATREE) and **D. Suresh Kumar** (TNAU). Expert consultation on Noyyal River Basin. Sponsored by IDRC Canada. Coimbatore. 24 September 2013.

Publications

Books

Lowman, M., S. Devy, T. Ganesh (Eds.). 2013. *Treetops at Risk: Challenges of Global Canopy Ecology and Conservation*. Springer publication. Hardcover. ISBN 978-1-4614-7160-8. ISBN 978-1-4614-7161-5 (eBook)

Peer reviewed articles

Aravind, N. A. 2013. Potential of social network and internet media for biodiversity mapping and conservation. *Current Science* 105(3): 291-293.

Belsare, A. V. and A. T. Vanak. 2013. Use of xylazine hydrochloride-ketamine hydrochloride for immobilization of Indian fox (*Vulpes bengalensis*) in field situations. *Journal of Zoo and Wildlife Medicine* 44(3): 753-755.

Borah, J., T. Sharma, D. Das, N. Rabha, N. Kakati, A. Basumatary, M. Firoz Ahmed and J. Vattakaven. 2013. Abundance and density estimates for common leopard *Panthera pardus* and clouded leopard *Neofelis nebulosa* in Manas National Park, Assam, India. *Oryx* doi:10.1017/S0030605312000373.

Delsink, A., A. T. Vanak, S. Ferreira and R. Slotow. 2013 Biologically relevant scales in large mammal management

policies. *Biological Conservation* 167: 116-127. <http://dx.doi.org/10.1016/j.biocon.2013.07.035>

Jorge, A., A. T. Vanak, M. Thaker, C. Begg and R. Slotow. 2013. Costs and benefits of the presence of leopards to the sport-hunting industry and local communities in Niassa National Reserve, Mozambique. *Conservation Biology* 27(4): 832-843.

K. Abhisheka, J. Patrick David, M. B. Prashanth, K. S. Seshadri and T. Ganesh. 2013. First detailed survey of waterbirds in Tirunelveli and Tuticorin districts, Tamil Nadu, India. *Journal of Threatened Taxa* 5(12): 4641-4652.

Krishnaswamy, J., M. Bonell, B. Venkatesh, B. K. Purandara, K. N. Rakesh, S. Lele, M. C. Kiran, V. Reddy and S. Badiger. 2013. The groundwater recharge response and hydrologic services of tropical humid forest ecosystems to use and reforestation: Support for the "Infiltration-evapotranspiration trade-off hypothesis". *Journal of Hydrology* 498: 191-209.

Krishnaswamy, J., R. John and S. Joseph. 2013. Consistent response of vegetation dynamics to recent climate change in tropical mountain regions. *Global Change Biology* doi: 10.1111/gcb.12362

O. K. Remadevi, N. Sapna Bai, T. O. Sasidharan, M. Balachander and P. Dharmarajan. 2013. Attempts at controlling Teak Defoliator (*Hyblaea puera* Cramer, Lepidoptera, Hyblaeidae) with the entomopathogenic fungus, *Metarhizium anisopliae* (Metsch.): laboratory, nursery and field trials. *International Journal of Pest Management* 59(3): 236-242 doi: 10.1080/09670874.2013.832438

Purushothaman, S., S. Patil, I. Patil, I. Francis and I. Nesheim. 2013. Policy and governance for sustaining livelihoods and natural resources in small

farms — a case study in Karnataka. *Indian Journal of Agricultural Economics* 68(2): 240-258.

Sreekar R., A. Mohan, S. Das, P. Agarwal, R. Vivek. 2013. Natural windbreaks sustain bird diversity in a tea-dominated landscape. *PLoS ONE* 8(7): e70379. doi:10.1371/journal.pone.0070379.

Srinivasan, V., B. K. Thomas, P. Jamwal and S. Lele. 2013. Climate vulnerability and adaptation of water provisioning in developing countries: approaches to disciplinary and research-practice integration. *Current Opinion in Environmental Sustainability* 5: 378-383.

Verissimo, D., A. Kanagavel, K. S. Seshadri, R. Raghavan. 2013. The tragedy of the nature photography commons. *Asian Journal of Conservation Biology* 2(1): 1-2.

Papers published in edited books

Lele, S. 2013. Environmentalisms, justices, and the limits of Ecosystems Services Frameworks. In: *The justices and injustices of ecosystems services* (ed T. Sikor). Pp.119-139. Oxon, UK: Earthscan/Routledge.

Popular press

Prashanth, M. B., M. Mathivanan and T. Ganesh. 2013. Owls of the forest's edge. *Sanctuary Asia*. August 2013.

Unnikrishnan, H. 2013. Lakes in the Anthropocene. In Global Water News newsletter. A newsletter of the Global Water System Project.

Papers presented in seminars/workshops/symposia/conferences

Atkore, V. Poster on 'What drives fish diversity in the rainforests of the Central Western Ghats, India' at SCCS-2013, Bengaluru. Co-authors J. Krishnaswamy and K. Shanker.

Lele, S. Delivered the keynote and presidential address on 'Arkavathy: from rejuvenation to governance' at public consultation on Arkavathy rejuvenation organized by Svaraj and Arkavathy Kumudvathi Nadi Punashchethana Samiti. Bengaluru. 2 July 2013.

Lele, S. Participated in panel discussion on water cooperation at the Sambandh Festival 2013 organized by Department of Sociology, Christ University. Bengaluru, 23 August 2013.

Lele, S. *Water management and watershed development at the rural-urban interface.* At workshop on Forest Conservation and Ecosystem Services; and Water Use, Livelihoods and Biodiversity. Organized by MacArthur Foundation. Bengaluru. 29 July 2013.

Niphadkar, M. *Testing geospatial modeling methods for management of invasion of understory shrub Lantana camara in tropical forests of Western Ghats, India.* Authorship of **Niphadkar M., Ficetola G. F., Bonardi A., Nagendra H., Padoa-Schioppa E., Adamo M., Tarantino C., Hiremath A.** Presented

at the 12th International Conference on Ecology and Management of Alien Plant Invasions. Pirenopolis, Goias, Brazil. 22-26 September 2013.

Paramesha M. *Functional corridors for wildlife conservation in human dominated landscape of the Western Ghats, India.* SCCS 2013, Bengaluru. 25 – 28 September 2013.

Srinivasan, V. *Adapting to Climate Change in Urbanizing Watersheds (ACCUWa) - a situation analysis.* IDRC-CCW workshop organized by IDRC Canada. Kathmandu. 18 June 2013.

Invited lectures

Lele, S. *Sustainability, environmentally sound development and the role of technology.* National Institute of Advanced Studies, Bengaluru. 24 July 2013.

Thomas, B. K. *Livelihoods and SDGs.* The Energy and Resources Institute, Bengaluru, during the Regional Consultation on Designing Sustainable Development Goals. 10 July 2013.



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This newsletter has been put together from
reports by ATREE folk. Design and layout is
by Salil Sakhalkar. Editing by Samuel Thomas,
Ganesan Balachander and Meetu Desai.