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Research

Sentinel landscapes: Looking at the relationship between land health and livelihoods



ATREE is participating in a research programme that examines the relationship between livelihoods and land health in forested landscapes that have undergone land-use change. What is exciting about this research is that it is committed to long term ecological and socio-economic study across cultures, institution types and governance styles, and it will combine village-level data snapshots with a zoom-out view of the issue in comparable sites across the world. This research is the Sentinel Landscapes Framework Assessment. It was conceptualized by the Center for International Forestry Research (CIFOR).

A sentinel landscape is a geographic area that is bound by a common issue in which a broad range of biophysical, social, economic and political data are monitored over a long period of time. In this case, the sentinel landscapes being studied are spread across the tropical belt: Borneo–Sumatra, the humid tropics of Central Africa, Mekong, Nicaragua–Honduras, West Africa, and Western Ghats in peninsular India. All six sites are biodiversity hotspots—areas of high biodiversity under threat



because of human activity. All six sites are a mix of agricultural and forested landscapes, or closely associated with forests.

India, with its poverty and vast rural populace, needs policies that are informed by an understanding of the land and how people use it. This research will show how the land that has been subject to use-change, degradation and urbanization has evolved, and the resulting curve that socio-economic or livelihood parameters have followed. It will also look at how human practices, policies and behaviour, especially related to household income, affect the ecology of the site over time. This kind of long-term data and monitoring are essential for addressing development and resource sustainability. They will also give scientists a much-needed perspective on the links between biophysical processes—for instance, those resulting from shifting cultivation, or pesticide use, or cropping patterns—to human reactions and an understanding of the impacts of those reactions on ecosystems.

The Sentinel Landscapes study is a global experiment and its design requires adherence to rigorous methodology, collaborative effort and communication across the sites being studied. The baseline sampling methodology used by this programme consists of Land Degradation Surveillance Framework and village level baselines and household surveys. ATREE is conducting the village and household level surveys. The team has identified representative sites that fulfill the site selection requirements in Kodagu, Chamarajnagar, Nilgiris and Wayanad. To make sure that methodology protocols percolate to field staff, ATREE held a four-day orientation workshop on data collection methods in June. The training was supported

by International Forestry Resources and Institutions (IFRI) and conducted by Rahul Chaturvedi and Pratiti Priyadarshini of Foundation for Ecological Security (FES). Ten staff participated.

The Sentinel landscape programme has been funded by Consultative Group on International Agricultural Research (CGIAR), through the Center for International Forestry Research (CIFOR), to study sustainable management of forests across 12 global sites, including the one in the Western Ghats. It is led by Centre de Coopération Internationale en Recherche Agronomique pour le Développement (CIRAD) and its partners. The Western Ghats component is a collaborative effort between ATREE, World Agroforestry Centre and CIRAD.

Siddappa Setty, Forests and Governance programme

Why do the blackbucks stray?

Historically, blackbuck ranged extensively in the grasslands of Tirunelveli and Tuticorin districts of southern Tamil Nadu. In recent times, land acquisition for various developmental activities and urbanization has shrunk their distribution to a small hill, 16km east of Tirunelveli. This isolated hill, covered with dense, thorny scrub, has been declared the Vallanadu Blackbuck Sanctuary, and is one of the five reserves for the endangered blackbuck in Tamil Nadu. However, blackbucks are animals of plains and flatlands and so they frequently drift from the sanctuary into the preferred open flat outside the reserve. Here, they come in conflict with quarries, industries, and residential layouts that are encroaching on the grasslands rapidly.



Personal takes

Personal takes is a column on first person accounts, experiences and opinions by people who do research. The following blog post is reproduced, with permission, from the blog by orchid hunter, Naresh Swami, Research Associate at ATREE, working on a first-time *in situ* photo-documentation of Himalayan orchids.

In pursuit of *Bulbophyllum penicillium*

After Sir George King and Robert Pantling's monumental work, 'The Orchids of the Sikkim-Himalayas', published in the year 1898, there have been several publications on orchids by various authors. A number of research works shared descriptions and study details of a particular species, *Bulbophyllum penicillium*, C. S. P Parish & Rchb.f. However, no photographs were made available by any of the other authors, which probably meant that this plant was not located by anyone in the wild.

Sir George King and Robert Pantling had mentioned August and September as its blooming time. The same was noted by all the other authors who wrote about this species. After a lot of effort I located a few plants from the region. I visited the plant several times during the months of June, July and August thinking it would bloom in those months. However, no



flowers appeared. Then I realized that the blooming time mentioned by Sir George King and Robert Pantling could be wrong and the researchers who followed may have been repeating the mistake. So, I decided to observe the plant throughout the year and visit the sites every ten days.

After a long wait, the racemes started appearing in the month of November, and finally it bloomed after the winter, in the first week of March. Later, I got another confirmation from Meghalaya; there too the species bloomed in the month of March, thus leading me to conclude that a mistake had cropped up in the monumental work of King and Pantling. The most interesting fact is that a number of eminent researchers restated the 'mistake' by mentioning the flowering time as August-September in their publications. This incident proves the need to study each and every species in their natural habitat before bringing out publications.

<http://naresh.org.in/blog/bulbophyllum-penicillium-c-s-p-parish-rchb-f/>

ATREE's Agasthyamalai Community-based Conservation Centre (ACCC) was invited by the Tamil Nadu Forest Department to provide inputs for the management plan of the Vallanadu Blackbuck Sanctuary and also see how water resources can be augmented to sustain the blackbuck population inside the sanctuary. ATREE did detailed surveys on herbivore and carnivore distribution, mapped existing water structures and enumerated available water sources around the sanctuary. We recorded presence of several mammal species, including the pangolin, Madras hedgehog, fox, spotted deer, sambar and blackbuck, besides a large resident population of feral cattle, goats and small packs of free ranging dogs. Blackbucks were recorded moving around in the vast stretches of open fallows adjoining the sanctuary, in search of forage and water.

Water is scarce here due to poor rainfall, and there are no perennial sources in the reserve. ATREE has suggested maintaining existing water structures, of which there are plenty, instead of developing new ones in an arid area where the creation of artificial water troughs and ponds could lead to a drastic change in the native flora and fauna. Developments around the sanctuary may be in violation of environmental rules and regulations: there is a fireworks storage unit, quarry and a residential layout adjacent to the sanctuary boundary. Apart from an unsuitable habitat competition with feral cattle for fodder, water and space makes the blackbuck population inside the reserve very vulnerable.

The Agasthyamalai Community-based Conservation Centre suggests that the Forest Department work closely with

the landowners and pastoralists who use the fallow for grazing hundreds of livestock, to develop a working model that facilitates use of the land by both blackbucks and livestock. Though there is hope, the rapid land-use change and the high stakes involved with such changes leaves us with mixed feelings.

*M. B. Prashanth and M. Mathivanan,
Tirunelveli*

Funding and research partnerships: Norwegian Ambassador at ATREE

ATREE received a grant of Rs. 14 crores from the Royal Norwegian Embassy (RNE) for work on climate change, biodiversity conservation, and environmental governance and policies. His Excellency, Eivind S. Homme visited the ATREE Bangalore office on April 29 to formally inaugurate the RNE-ATREE partnership. He was accompanied by Ms. Signe G. Gilen, Counsellor and Head of Cooperation, RNE, New Delhi; Ms. Marianne Jensen, Science and Technology Counsellor, RNE; and Advisor, Suresh Mathevan.

The ambassador congratulated ATREE on its ability to attract young talent to study environmental sciences and pursue it as a career option. An accompanying group of researchers from the Norwegian University of Life Sciences (UMB), Norwegian Institute for Nature Research – NINA, and Natural History Museum, University of Oslo spent time with ATREE scientists to explore options for collaboration.

The cooperation is expected to strengthen ATREE's doctoral programme, which seeks to build human resources in Sustainability Science. It will also enable faculty and student exchanges between Norwegian research institutes and ATREE.

Outreach

Helping farmers rethink water

The Adapting to Climate Change in Urbanizing Watersheds (ACCUWa) project seeks to understand how multiple stressors like climate change, population growth and urbanization will impact water users. The research is being conducted in consultation with a range of stakeholders, including farmers. The research team wanted to share preliminary findings as well as involve the communities in ongoing participatory research. So, in its second year of research, it launched the 'Arkavathy Water Literacy Campaign'.

The water literacy team shares scientific information and useful knowledge about policies and institutions with rural communities. The potential of such an exchange might be illustrated in this example: The Arkavathy River has dried up. When asked why the river has gone dry, we found that farmers typically blamed the lack of rain. However, rainfall data over the years do not support this. By presenting the data, the water literacy team was able to challenge the perception of 'no rain=dry river'. More importantly, the team was then able to direct the discussion to other potential reasons for the drying of the river, which have not been acknowledged: like ground water extraction, eucalyptus plantations and unplanned urbanization, and to also talk about possible solutions.

Campaign team members, Janardhana Kesaragadde and G. Manjunatha have made presentations in dozens of small farmer meetings in the Tippagondanahalli (TG Halli) catchment of the Arkavathy basin, where they also recruited participants into the team's participatory hydrologic monitoring

efforts. They have also made water literacy presentations in several colleges in the catchment to recruit young volunteers for conducting stream and land use surveys, and a comprehensive well census. Through their efforts, the team obtained permission to install Community Automatic Weather Stations (AWS) at Hadonahalli and SM Golahalli villages in collaboration with the local Gram Panchayats. These weather stations were inaugurated with much fanfare and music by the group *Bhoomi Tayo Balaga*. Devanahalli MLA, Mr. Pillamunishamappa, who inaugurated the Hadonahalli AWS, called for more such efforts that could help farmers understand what is happening to their water.

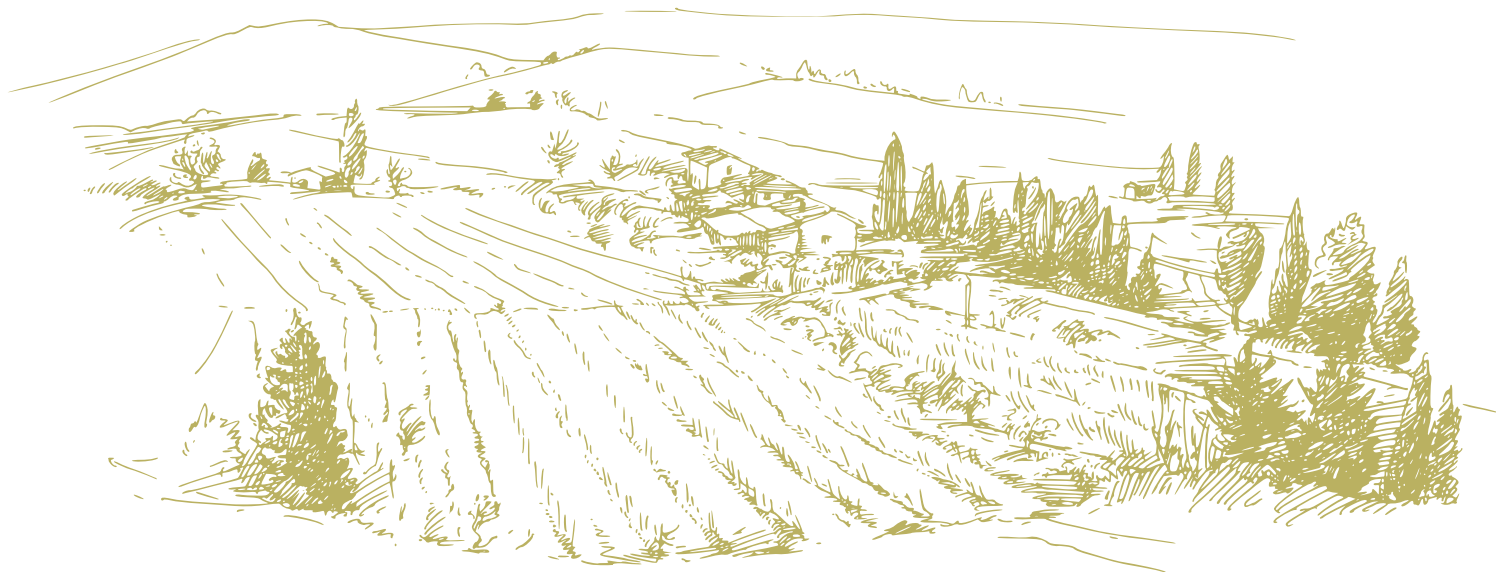
As part of this outreach effort, ACCUWa project Principal Investigator, Dr. Sharad Lele, Senior Fellow, ATREE appeared in an interview on Doordarshan TV (Kannada channel) on 11 May 2014.

The outreach activities are beginning to generate interest. Several farmers have come forward to install soil moisture sensors on their land and are becoming involved in the groundwater monitoring effort.

*Veena Srinivasan, Land, Water,
Livelihoods programme*

Orienting research to inform policy on ecosystem services

ATREE organized a workshop, sponsored by the South Asian Network for Development and Environmental Economics (SANDEE), to identify knowledge gaps on ecosystem services in the South Asian context, on 14 and 15 April. The multi-disciplinary group of thirty participants was from India, Bangladesh, Nepal, Bhutan and



Singapore, representing the Ministry of Environment and Forests, India; SANDEE; College of Natural Resources, Royal University of Bhutan; Wetlands International; ICIMOD; GTZ; Azim Premji University; NCBS; NIAS; WWF; and, the Institute of Economic Growth.

Ecosystem services—that is, services derived from nature—are not seriously recognized in official discourse. National strategies on climate change and water are yet to incorporate the latest thinking and concepts related to ecosystem services. Land-use change is still not perceived as a threat to biodiversity and ecosystem health. Emerging challenges, such as the crisis in agriculture and water sectors, with implications for inter-region water sharing, and the rapid change in coastal landscapes decreasing our resilience to climatic changes, could benefit from an articulation of the scientific underpinning so that ecosystem services may be managed for sustainable development.

The participants tried to identify policy gaps in the economics of ecosystem services, evolve a research agenda for the next five years to address these gaps, and explore possibilities

for interdisciplinary research. They deliberated on what specific ecosystem services (and disservices) researchers should focus on based on policy priorities/demand; the political, economic and scientific questions that need to be addressed to better manage these specific services, the methodological challenges in examining the contributions of these services to human welfare, and identified services that might be more practically examined by multi-disciplinary teams.

Fellowships for Environmental Communication

The Forum of Environmental Journalists in India (FEJI), whose aim is to train, motivate and sensitize journalists to cover environment and development issues in daily reporting, approached ATREE for a media fellowship programme on environmental reporting late last year. ATREE has been keen to put itself in a place where it can add depth to development reporting as part and parcel of environmental reporting. This was a good opportunity.

Three journalists were selected: Ananda Banerjee of Live Mint, New Delhi, who elected to write on less charismatic species; Atul Kumar, Hindustan (HT Hindi), New Delhi, who would pursue issues on groundwater; and Amit Upadhye, Deccan Chronicle, Bangalore, who would research and report on the status of wetlands. The plan was for the journalists to spend the first quarter of 2014 travelling, studying and writing on the selected themes and their complexities in conservation today. Several articles that have resulted from this partnership have been published and are accessible on the FEJI website, or the Press page in the ATREE website: wolves of the wasteland, dholes, lakes in Bangalore, Vembanad Lake, and on groundwater use and agriculture and water and pollution.

On top of the earth

The Eastern Himalayan region has been identified as one of 32 global biodiversity 'hotspots'. Despite the region being relatively well explored, forest canopies here have remained an unexplored domain.

To fill this gap, ATREE and Makaibari Tea Estate organized a two-day training workshop to popularize tree climbing in the region. The workshop was organized at Makaibari Tea Estate on 20-21 May 2014. The objective was to train community forest rangers, nature guides and tourism entrepreneurs in tree climbing and to popularize tree/canopy climbing so that these skills might be used for monitoring or for organizing adventure activities for tourists. Fifteen individuals, including researchers, community rangers, nature guides, community-based tourism entrepreneurs and people from Darjeeling and Sikkim participated.

The training was organized by Soubadra Devy, pioneer of canopy research in India, and coordinated by the ATREE Eastern Himalayas Programme office and Mr. Rajah Banerjee, owner of Makaibari TE. The training was imparted by Chia from ATREE, Tamil Nadu and research scholar Urbashi Pradhan, both trained in tree climbing. Speaking on the occasion, Dr. Sarala Khaling, Regional Director, ATREE Eastern Himalaya office, and Dr. Soubadra Devy said that this initiative was part of a 'citizen naturalist' programme. They explained that the objective was not just to provide training in tree climbing, but to make folks aware of the immense biodiversity and natural wealth of the region.

Participants showed great interest in tree climbing and have requested ATREE to organize more focused, longer duration climbing workshops in the future. ATREE is hopeful that such training will lead to more people becoming interested in tree climbing, biodiversity conservation and spreading awareness about the environment in their communities.

Urbashi Pradhan, PhD, 2009 batch

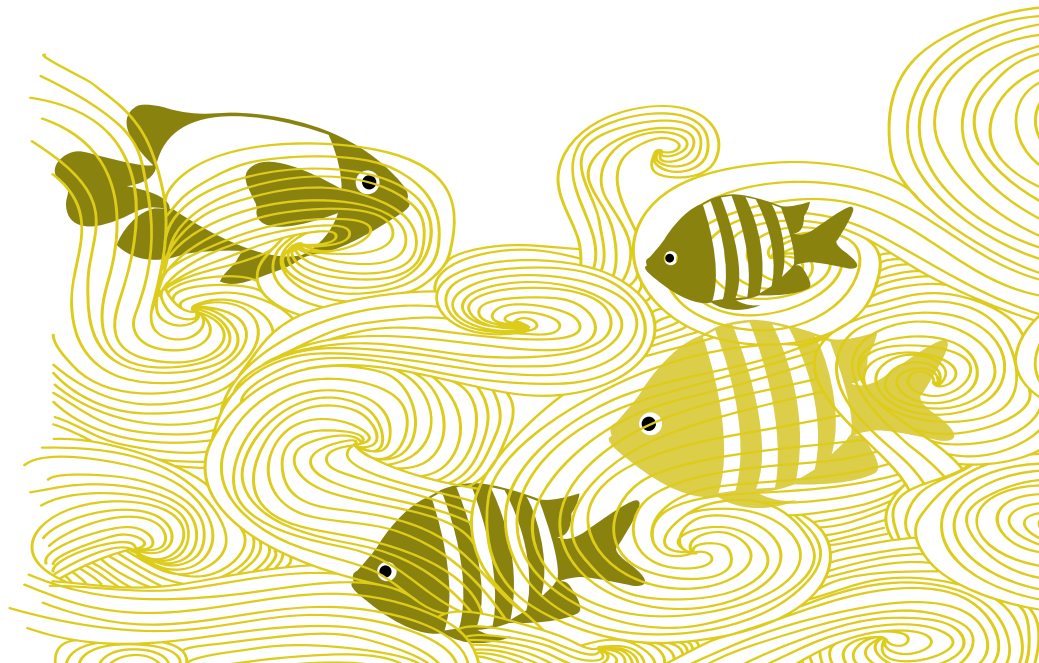
Vembanad Fish Count 2014

The seventh edition of the Vembanad Fish Count yielded 57 species—an increase from last year's count of 42. However, experts at ATREE suggest that an increase in species numbers does not necessarily point to an improvement in ecosystem health. Though there has been an overall increase in species numbers, for example from 60 to 67 over 2008 to 2011, 28 fish species encountered in the 1980s seem to have disappeared. 86% of these missing species are marine migrants, leading researchers to surmise that the Thaneermukkom barrage, and the presence of invasive species might be responsible for this selective decline. A comparison of data from 1985-89 shows migratory species dominating at 56%, now reversed with resident species dominant at 69% of the composition. This has direct impacts on the livelihoods of the fishers, since the migrant species had a higher fishery value than the resident freshwater species.

This year's catch has forty two finfish, twelve crustaceans and three mollusc species. Two rare species were found: *Anguilla bicolor* (an eel species) and *Channa diplogramma* (Malabar snakehead). The survey also reported

many juvenile of pearl spot (*Etroplus suratensis*), although the current harvesting of pearl spot and freshwater prawns was seen to be unsustainable, and an increase in yellow cat fish (*Horabagrus brachysoma*) and other indigenous species. The survey team surmised that the increase in pearl spot and other species might be due to timely operation of Thannermukkom Barrage. But fisherfolk reiterated their concern over the manipulation of the Barrage: they suggested that if the barrage could be opened earlier in the year (in March instead of July), the sea's flushing action would improve ecological parameters of the lake, its biodiversity and productivity of the system. But then what are the implications for rice cultivation in this Kuttanad bowl below sea level?

This time's count was held on 29 and 30 May at Alappuzha. The first day was devoted to orientation for fish sampling and census and collecting water quality data. Volunteers were equipped with field guide to fishes of Vembanad, checklists and water quality monitoring kits. Hundred and ten volunteers consisting of local residents, fisher-folk, environmentalists, ATREEans, college and school students from within Kerala and outside participated.



The Vembanad fish count is a regular calendar event for the ATREE Community Environmental Resource Centre (CERC) and its supporting partners, Kerala University of Fisheries and Ocean studies (KUFOS), Kochi, Vembanad Nature Club, Federation of Lake Protection Forums around Vembanad Lake, RARS Kumarakom, Conservation Research Group, Kerala, St. Albert's College, Kochi, Kerala State Biodiversity Board, and CGH group. Prof Madhusoodana Kurup, Vice Chancellor, KUFOS summed up the reasons for the decline in fishery production in Vembanad Lake in a valedictory after the count. The captains from each cruise presented their findings and insights from the fish count. Building up a long term data base of even subtle changes in the ecosystem will help in the management of this unique ecosystem.

Jojo T. D., Community Environmental Resource Centre, Vembanad

'Raise your voice, not the sea level'

'Raise your voice, not the sea level' was the slogan for 41st World Environment Day celebrated at Vembanad on 5 June 2014. ATREE initiated the environment day celebrations by planting mangrove saplings on the banks of Vembanad Lake in Varanam Panchayat.

Jojo T. D., Community Environmental Resource Centre, Vembanad

Jalapaadom teacher orientation workshop

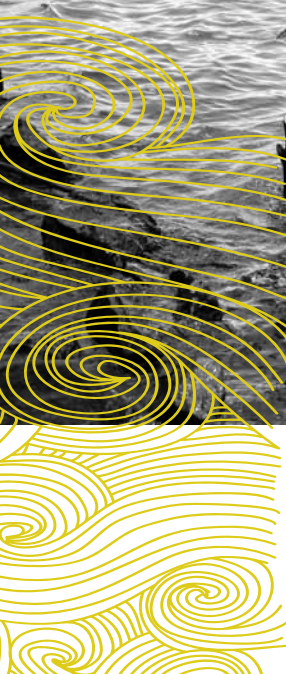
The teacher-training workshop of the Jalapaadom programme for the academic year 2014-2015 was held at ATREE, Alappuzha on 24 June 2014. The teachers were introduced to the India Biodiversity Portal (IBP), thanks to Dr. R. Prabhakar (chief architect of the IBP, which is an open, collaborative platform for biodiversity information of India) and his colleague, Dr. Thomas Vattakkaven.

Dr. Vattekkaven introduced the portal and demonstrated how teachers and children could upload information on biodiversity siting on the portal. The CERC team, distributed field guides of plants, reptiles, amphibians, birds and butterflies to aid identification of common species.

The teachers, along with the CERC team, identified eight schools that would participate in the intensive Bioblitz programme. This year's workshops would be on research methodologies; paper and plastic reuse; also a nature camp in SELECTED wildlife sanctuaries/reserve forests in Kerala, besides the routine programmes for *Jalapaadom* in schools.

Thirty-one teachers from twenty-five schools and three colleges of Alappuzha and Kottayam districts participated in the workshop.

Jojo T. D., Community Environmental Resource Centre, Vembanad



New

Recognitions

ATREE President, **Professor Kamal Bawa** was honoured by the University of Alberta, Edmonton, Canada on April 10, when he received an Honorary Doctor of Science Degree from the University, and delivered the convocation address to graduates in science and engineering.

Sharachchandra Lele has been elected President of the Indian Society for Ecological Economics (INSEE) for the years 2014-16. Sharad is also a founder-member of INSEE and has served on its Executive Committee for six years in various capacities. Sharad Lele was also on the Syllabus Drafting Committee for Environmental Studies, Nalanda University.

Jagdish Krishnaswamy, Senior Fellow, ATREE and **Seema Purushothaman**, ATREE Adjunct faculty, have been elected Executive Committee Members, INSEE.

Nitin Rai, Fellow and Convenor, Academy for Conservation Science and Sustainability Studies has been invited to serve on International Union of Forest Research Organizations—LUFRO's Global Forest Expert Panel on Forests and Food Security.

Student achievements

Vikram Aditya, PhD batch of 2011 has been selected for the Conservation Leadership Programme award for work on '*Effect of landscape change on mammals in Eastern Ghats, India*'. As part of this grant, he attended the CLP Conservation Management and Leadership Training Workshop at

the Barrier Lake Field Station of the University of Calgary, Alberta, Canada in June-July for two weeks.

Rahul Muralidharan, PhD batch of 2013, has been selected as a Duke Global Fellow in Marine Conservation for 2014. Rahul will work on interdisciplinary fundamentals of marine conservation biology and policy when he attends the Duke University Marine Laboratory's 2014 summer session in July-August.

Madhuri Ramesh, batch of 2011, got a Rufford small grant for her PhD work on '*Marine turtle conservation in Odisha, India: to demarcate or diversify?*'

Ronita Mukherjee, also of the 2011 batch, is partially funded by a Rufford grant for her work on '*Assessing the scope for pollinator-friendly agriculture in the peri-urban landscape of Bangalore, India*'. She also attended the Winter School in Environment and Resource Economics, Kathmandu, Nepal, 4-13 March 2014.

Grants

DST will fund **T. Ganesh** and **N. A. Aravind** for their project, '*Tracking migrant harriers across space and time: understanding migration patterns and identifying key habitats*'.

People

Chandrima Ningombam has joined as Senior Research Fellow on the project on '*Biotechnological interventions for utilization and conservation of forest resources*' funded by DBT, GoI. **Dr Zahoor Pir**, **Niarah Bhatt** and **Arif Hussain** have been taken on as consultants on the Dal lake project in Srinagar. **Parvathy Menon**, **Dhavamani** and **Rahul S. Varier** join the IDRC team in Coimbatore as Research Assistants; with **Malavika Gopinath** as consultant to the team in Bangalore; and **John, Vivek M.** and

Vijayalakshmi in Coimbatore. **Shahid Saiyed** is consultant on the RAMBLE project. Bangalore. **Badush A.** joins as Research Assistant in Alappuzha. The new Sentinel Landscape project has five consultants: **Kishan B.**, **Harisha K.**, **Arshiya Bose**, **Hari Prakash J. R.** and **Megha Rao. Srinidhi**, with CEFIPRA, Bangalore.

Publications

Book chapters

George, A. M. and **Jojo T. D.** 2014. Integrated approach for sustainable tourism in Vembanad Lake: a way forward. In: *Environment and Tourism and Development: International Perspectives* (ed B. Vijayakumar). pp305-310. Trivandrum: Kerala Institute for Tourism and Travel Studies.

Shivanna, K. R. 2014. Reproductive assurance through autogamy in some annual weed species. In: *Proceedings of the National Academy of Sciences, India Section B: Biological Sciences* 84(3):681-687.

Peer reviewed articles

Aravind, N. A., **R. R. Sarma**, **M. Munsif** and **S. Sen.** 2014. In search of *Corilla anax* (Corillidae), rare and endemic land mollusc of the Western Ghats. *Tentacle* 22: 7-9.

Das, S., **B. Behera** and **A. Mishra.** 2014. Factors affecting household perception of wetland biodiversity conservation in West Bengal, India. *International Journal of Ecological Economics and Statistics* 34 (3).

David, P., **R. Manakandan**, **T. Ganesh.** 2015. Frugivory and seed dispersal by birds and mammals in the coastal tropical dry evergreen forests of southern India: a review. *Tropical Ecology* 56(1): 41-55.



- Gopal, D. and H. Nagendra.** 2014. Vegetation in Bangalore's slums: boosting livelihoods, well-being and social capital. *Sustainability* 6: 2459-2473.
- Gururaja, K. V., K. P. Dinesh, H. Priti and G. Ravikanth.** 2014. Mud-packing frog: a novel breeding behaviour and parental care in a stream dwelling new species of *Nyctibatrachus* (Amphibia, Anura, Nyctibatrachidae). *Zootaxa* 3796 (1): 033–061.
- Ismail, S. A., J. Ghazoul, G. Ravikanth, C. G. Kushalappa, R. Uma Shaanker, and C. J. Kettle.** 2014. Fragmentation genetics of *Vateria indica*: implications for management of forest genetic resources of an endemic Dipterocarp. *Conservation Genetics* doi: 10.1007/s10592-013-0559-7
- Ismail, S. A., J. Ghazoul, G. Ravikanth, C. G. Kushalappa, R. Uma Shaanker, and C. J. Kettle.** 2014. Forest trees in human modified landscapes: ecological and genetic drivers of recruitment failure in *Dysoxylum malabaricum* (Meliaceae). *PLoS ONE* 9(2): e89437
- Kannan, R., C. M. Shackleton and R. Uma Shaanker.** 2014. Invasive alien species as drivers in socio-ecological systems: local adaptations towards use of Lantana in Southern India. *Environment, Development and Sustainability* 16:649–669.
- N. Sapna Bai, O. K. Remadevi, T. O. Sasidharan, M. Balachander and P. Dharmarajan.** 2012. Cuticle degrading enzyme production by some isolates of the entomopathogenic fungus, *Metarhizium anisopliae* (Metsch.). *Journal of Bio-Science* 20: 25-32. (Note: Though this paper was submitted in 2012 and shows that year as the year of publication, it was published in 2014.)
- Nagendra, H., and E. Ostrom.** 2014. Applying the social-ecological system framework to the diagnosis of urban lake commons in Bangalore, India. *Ecology and Society* 19(2): 67.
- Savitha M., Jojo T. D. and G. Kuriakose.** 2014. Interspecific interaction between *Cryptocoryne* sp. and *Ectophasia suratensis* B. (Pearl Spot) in the estuarine ecosystem of Vembanad Lake in central Kerala. *Heartian Journal of Pure and Applied Sciences* 3(1): 90-98.
- Senthilkumar, U., R. K. Choudhary, M. Sanjappa, D. Narasimhan, R. Uma Shaanker and G. Ravikanth.** 2014. Livelihood and revenue: role of rattans among mongoloid tribes and settlers of Andaman and Nicobar islands, India. *Ethnobotany Research and Applications* 12:141-154.
- Smitha, S. G., T. O. Sasidharan, O. K. Remadevi and J. Bhattachaya.** 2013. Microsporidian infection in wild and



captive-bred populations of butterflies in South India. *Biosystematica* 6(2): 39-45.

Ticktin, T., R. Ganesan, P. Mallegowda and S. Setty. 2014. Disentangling, again, the drivers of population decline for two harvested species: a response to Prasad et al. 2014. *Journal of Applied Ecology* doi: 10.1111/1365-2664.12249.

Popular press

Jesudasan, A. and T. Ganesh.

Investment trick. Down to Earth.

31 May 2014.

Harisha, R. P. *Crunchy, juicy devil's backbone*. Down to Earth. June 2014.

Priti Gururaj. *Relic forest, tadpoles and foot-flagging frogs*. Sanctuary. June 2014.

Reports

Five-year assessment of the CEPF investment in the Western Ghats region of the Western Ghats and Sri Lanka biodiversity hotspot: a special report. Report available at <http://www.atree.org/publications/reports>

Papers presented

Gururaj, P. Poster presentation, 'Effects of habitat fragmentation on stream dwelling frogs from Central Western

Ghats'. Michigan Complexity Mini Conference (MCMC), University of Michigan. 9 May 2014.

Lele, S. *What does it mean to 'adapt' to CC? Some thoughts from an ongoing study in southern India*. International workshop on 'How (well) are we adapting to the water-related impacts of climate change?' Organized by Interdisciplinary Centre on Climate Change, University of Waterloo. Waterloo, Canada. 19-20 June 2014.

Talks

Ravikanth, G. 'Why conserve genetic resources' and 'DNA barcoding'. At workshop on *Himalayan Biodiversity and Bio-resources: Mapping, Utilization and Conservation*. Department of Botany, University of Kashmir, Srinagar. 8-10 May 2014.

Ravikanth, G. *New genomic resources to understand genetic diversity and promote crop improvement of jackfruit (Artocarpus heterophyllus), breadfruit (A. altilis), and other under-utilized Artocarpus crops*. International symposium on 'Jackfruit and breadfruit of the tropics'. 15-16 May 2014. University of Agricultural Sciences, Bangalore.

Lele, S. *Climate change and water: Preliminary insights from urbanizing basins in India*. International

Development Research Centre (IDRC). 23 June 2014, Ottawa, Canada

Invited lectures

Lele, S. *Understanding Indian forestry in the context of Godavarman, Forest Rights Act and REDD+*. Department of Environmental Science, Bangalore University. 4 April 2014.

Lele, S. *Forests, environment and people: from human rights to democratic governance*. Tata Institute for Social Sciences, training programme for Indian Forest Service probationers. 2 May 2014.

Lele, S. 'Participation, resource rights and governance' and 'Interdisciplinary analysis of the environment'. Thor Heyerdahl Summer School on the Green Economy, University of Life Sciences (Noragric), Norway. 25-26 June 2014.



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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.