

Forests of the Western Himalaya*

The forests of the Western Himalaya are important both for their biodiversity and the ecosystem services they provide to the north Indian plains. Despite their apparent similarity to temperate forests in terms of tree species (often oak and pine-dominated systems) and cool average temperatures, these forests have distinct ecological traits. High nutrient turnover rates and productivity, and a phenology adapted to the summer drought, make these forests more similar to tropical forests in several respects. These are also forests that provide an excellent opportunity to understand the impacts of large scale, low intensity disturbance caused by human activities such as lopping or branch pruning and removal of leaf litter.

This region also seems more impacted by global climate change than some other parts of the world, and given the steeply undulating topography, intense extractive pressures and forest fragmentation, the loss of biodiversity is a bigger threat than elsewhere. While data remains patchy, there is some evidence to show regional patterns in changes in mean temperature and precipitation, and the rise of extreme events, as well as local perceptions of climate change as evidenced by reports of early bud burst and flowering; or occurrence of insects and pests not seen before at particular altitudes

Participants from the Ashoka Trust for Research in Ecology and the Environment (ATREE), G.B. Pant Institute for Himalayan Environment and Development (GBPIHED), Dakshin Foundation, National Centre for Biological Sciences, Indian Institute for Remote Sensing, Wildlife Institute of India and the Uttarakhand Forest Department attended the

workshop. The workshop aimed to build multi-disciplinary and multi-institutional research collaboration on issues related to Himalayan ecology, increasing opportunities for training and learning, and strengthening ties between scholars and conservation practitioners.

An overview was provided by Ghazala Shahabuddin (Centre for Ecology Development and Research (CEDAR)) who focused on the role of these forests as key to sustained ecosystem services such as hydrological balance, nutrient balance, mitigating climate change, biodiversity conservation and rural livelihoods. These ecosystem services are today under threat due to serious loss in forest area and decline in quality of forests, which can be measured by loss of species diversity of flora and fauna, declining basal area, reduced tree regeneration and other features. While historically commercial exploitation has been a primary cause for forest degradation, recently chronic disturbance for fuelwood and fodder, large-scale infrastructure development, dams, climate change and land-use change are leading to serious forest loss and degradation. Yet many governmental and non-governmental organizations are working to reverse these trends through restoration, involvement of local people, nature awareness and educational activities and development of sustainable livelihoods that will stem the tide of migration to the plains. Despite high biodiversity, the Western Himalaya has received less global attention compared to the Eastern Himalaya which has been listed as a Global Biodiversity Hotspot. Several important ecosystems and biomes in the Western Himalaya require study and conservation, especially in the context of dramatic land use changes, extractive pressures and climate change impacts.

Tim Gregoire and Peter Crane of Yale University spoke of the Yale Himalaya initiative (YHI) and the efforts of Universities to link up research across the Himalaya. P. P. Bhojvaid (FRI) addressed the gathering during the inaugural session. The key-note address, delivered by Kamal Bawa (ATREE; University of Massachusetts), focused on ATREE's work in the Eastern Himalaya, where detailed studies are being carried out on

the processes underlying forest degradation and loss, and its implications for rural livelihood and enterprise. Further he deliberated on the tracking of climate change, its perception by local communities and the local interventions being carried out by ATREE to ameliorate the social impacts of climate change, particularly agricultural livelihood. He focused on the lacunae in the quantitative understanding of climate change and its impact.

There were three technical sessions focusing on (1) causes of forest degradation and impacts on ecosystem services, (2) scientific basis for forest conservation and restoration and (3) development of sustainable livelihoods including ecotourism, organic agriculture, and alternative energy sources.

Rajesh Thadani (CEDAR) while opening the session on forest degradation described the ecological processes underlying forest degradation and lack of data and studies on lopping and litter removal. Below ground processes, mycorrhizal root density and soil nutrients are all significantly impacted by chronic disturbance. Removal of leaves as green fodder and later as leaf litter depletes a significant proportion of nutrients and can suppress carbon sequestration rates by over 80% in disturbed forests. The importance of providing local communities with alternative biomass products was discussed.

Mark Bradford (Yale University) spoke of the impacts of degradation on belowground diversity and carbon sequestration. Raman Kumar (Nature Science Initiative) described changes in bird diversity in sal (*Shorea robusta*) forests under different disturbance and management regimes, while Satya Kumar (Wildlife Institute of India) talked of projected impacts of hydroelectric projects on Himalayan wildlife. Changes in forest structure may not be very visible, but be it planned silvicultural management or unplanned localized lopping, these have significant impacts on birds and wildlife as demonstrated by his talk on woodpecker diversity in managed forests.

S. P. Singh spoke of the unique physiological attributes of Western Himalayan forests. Conservation in the

*A report on the international workshop on 'Forests of the Western Himalaya: Conservation and Restoration of Ecosystem Services in a time of Climate Change' held at the Forest Research Institute, Dehradun during 28–29 June 2014. It was organized by the Centre for Ecology Development and Research (CEDAR) and co-hosted by the Yale School of Forestry and Environmental Studies (Yale-FES), USA, and the Forest Research Institute (FRI), Dehradun. Primary support was by the Indo-US Science and Technology Forum (IUSSTF).

light of changes in climate was an important thematic issue. This was also highlighted in a talk by Jagdish Krishnaswamy (ATREE), who spoke of changes in hydrological balance due to climate change. The importance of ecosystem services in water supply to Himalayan towns and the need to protect recharge zones through better identification (through hydro-geological surveys) and legislation were discussed. Increased developmental activities, such as the building of hydropower projects, through generation of debris and changes in water flow, modify local ecosystems.

The concept of sustainability was debated. The discussions were triggered by Barry Noon's (Colorado State University) lecture on concepts underlying ecological sustainability. Providing alternatives to biomass products, use of devices such as improved cookstoves to reduce fuelwood use, and the potential of ecotourism to justify protected areas and generate local employment were discussed. The multiplier effect of forest livelihoods in generating downstream employment and potential of REDD+ to accelerate such endeavours were focused on. Rajiv Bhartari (CCF Ecotourism, Uttarakhand Forest Department) spoke on the potential of ecotourism in con-

serving biodiversity and generating local employments and livelihoods. NGOs such as CHIRAG, Himmothan and People's Science Institute also discussed their grassroots-level interventions to build and improve sustainable livelihoods in the Himalaya. Issues of social, capital, livelihood revival and natural resource conservation were discussed in detail.

The workshop also discussed a set of recommendations for Himalayan ecological research that can feed productively into long-term research, conservation and field-level implementation. The workshop was followed by a field trip for the invited participants to the Mussoorie–Dhanolti area where the Jabbarkhet Private Conservation Reserve and Dhanolti Eco-Park were visited. Jabbarkhet is an example of partnership among scientists, NGOs and local residents to conserve a critical watershed near Mussoorie; and Dhanolti Eco-Park is a governmental initiative to conserve high-altitude forests with local support. The success of these initiatives shows that much is possible, when different institutions both governmental and non-governmental, work together.

The workshop highlighted the glaring lack of published data from the Western

Himalayan forest ecosystems, particularly related to impacts of climate change, land use change, extractive pressures and infrastructural development. Further there is little long-term data on vegetation that can help uncover dynamics with respect to the disturbances or faunal study that measures rates of extinction from the area. Forest restoration and conservation are areas in need of urgent attention, as most of the hands-on restoration work lacks documentation and the impacts of the work carried out so far is little understood. Above all, given the immense biodiversity in the Western Himalaya and the diversity of people dependent on it, it has become essential to document and understand people–nature relationships in much greater detail. There is also scope for synergy across different conservation objectives: for instance, convergence of biodiversity conservation and hydrological restoration can give rise to effective ameliorative strategies.

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MEETING REPORT

Insects related to veterinary and fisheries sciences*

Arthropod-related disorders cause significant health problems to humans, domestic animals and wildlife. In addition to causing direct damage by feeding, they act as vectors in transmitting diseases. In India, knowledge being generated on insects of economic importance affecting animals and fishes is limited to veterinary and fisheries institutes. In an attempt to take stock of the work done till date in India, identify the gaps and propose a way forward, a brainstorming session was held.

*A report of the brainstorming session on 'Insects related to Veterinary and Fisheries Sciences', held at the ICAR-National Bureau of Agriculturally Important Insects, Bengaluru on 2 August 2014.

Transmission of pathogens from animals to humans has had impact on human civilization and animal husbandry. Fleas feeding on blood of humans and animals transmit diseases like murine typhus and bubonic plague. Mosquitoes feeding on blood meal of pigs infected with Japanese encephalitis virus, transmit it to humans. Hence controlling of insects that infest animals would aid to improve human health too.

Inaugurating the meeting, S. Ayyappan (Indian Council of Agricultural Research (ICAR)) stressed the need to scale down the economic damage caused by insects in veterinary and fisheries-related activities. He was of the opinion that greater collaboration among veterinarians, fisheries scientists and entomologists is needed in the field of insect systematics

and in identifying the newer and safer molecules to be used for managing these pests on animals and fishes. Traditional knowledge also is to be exploited or refined while developing modern pest management techniques.

Introducing the theme, Abraham Verghese (ICAR-National Bureau of Agriculturally Important Insects (ICAR-NBAII)) emphasized the need for an interface among entomologists, veterinarians and medical scientists to churn out comprehensive ideas to solve problems arising due to insects. He mentioned that the focus of the session was to bring together the entomologists, veterinarians and fisheries scientists on a common platform to share their experiences on pests related to veterinary and fisheries.