

Rufford India Conference, 2021

Fostering Grassroots Conservation In India
(A Rufford Initiative)

Organised in collaboration with the Foundation
for Ecological Research, Advocacy and Learning

6th to 9th December, 2021
At Sun-n-Sand, Juhu Beach, Mumbai

India Conference Report, 2021.

The Rufford Foundation's Small Grants Programme enables numerous researchers in various developing countries to carry out nature conservation projects. So far, it has funded 1,169 grassroots projects in the Indian sub-continent and 5,566 projects worldwide.

The first Rufford Conference was held in India in 2012, and since then, subsequent conferences have been organised in collaboration with the Foundation for Ecological Research, Advocacy and Learning (FERAL). Each year the conference is held in a different part of the country, and this year, it was held at Sun-n-Sand, Juhu Beach, Mumbai. Mumbai is the second most populous city in India and known as the financial, commercial and the entertainment capital of India. Previous Rufford conferences have been held in Ramnagar, Uttarakhand, New Delhi, Bengaluru, Sawai Madhopur, Rajasthan, Goa, and Wandoor, Andaman Islands.

This year, due to the Covid-19 pandemic, the Rufford conference was a mix of online and off-line events, and participants had the option of attending the conference in-person or virtually. During the conference, there were twenty-seven presentations by Rufford grantees, two plenary talks, and three popular talks. Participants were also taken to visit the Godrej Mangroves in Vikhroli, Mumbai.

Presentations during the conference covered a wide range of species and landscapes from students to early career researchers to grantees who had received all five grants offered by The Rufford Foundation's Small Grants Programme. The Rufford conference not only gives grantees a chance to present their work and receive feedback, but it is also instrumental in giving researchers a platform to form collaborations and discuss ideas and potential solutions to pressing issues.

A list of participants, schedule and abstracts for each project can be found in appendix one, two and three, respectively.



Day 1

Srinivas Vaidyanathan, a senior researcher at FERAL, began by welcoming the participants, after this, there was an interactive session for participants to introduce themselves and get to know one another.



Durga Prasad Srivastava introduces himself to the rest of the participants.



Vinny Jain introduces herself to the rest of the participants.

Then Prof Haripriya Gundimedha from the Indian Institute of Technology Bombay, the first plenary speaker, gave a talk about the rationale for adopting a holistic assessment of agrifood systems and broke down The Economics of Ecosystems and Biodiversity's (TEEB) AgriFood Evaluation Framework. This framework provides a methodology to evaluate food systems taking into consideration their linkages and impact on the environment, society and human health.

Prof Gundimedha then applied this framework to evaluate the state of wheat and rice production in Punjab post India's Green Revolution. She showed how by holistically looking at agrifood systems in Punjab, one can see that although output has increased, the impact of the Green Revolution on soil and biodiversity has not all been positive. Moreover, the use of pesticides and fertilisers has increased.

She also spoke about the policy implications of implementing a holistic framework for evaluation.

The next presentation was by Ravi Jambekar, who spoke on art, conservation, and his experiences in the field. Jambekar began his talk by discussing his research on analysing the distribution of butterflies based on habitat specialism or generalism and matrix resistance. Through his study, he documented 6,330 individual butterflies belonging to 118 species and showed how different species show a wide variation in habitat association, and how generalist species were more common compared to specialists.



Ravi Jambekar talks about art, conservation, and his experiences from the field.



Ravi Jambekar shows illustrations he began sketching from objects he found during his fieldwork

Jambekar then spoke about what sparked his interest in art as a means of science communication. He narrated how he began sketching objects found during his fieldwork that he then uploaded on social media. As time passed, he slowly began receiving requests for commissioned pieces. He has since even illustrated a children's book!

Jambekar touched upon the need to make science communication more interesting and appealing and concluded by saying that for him the combination of art and science seems to be the way forward.

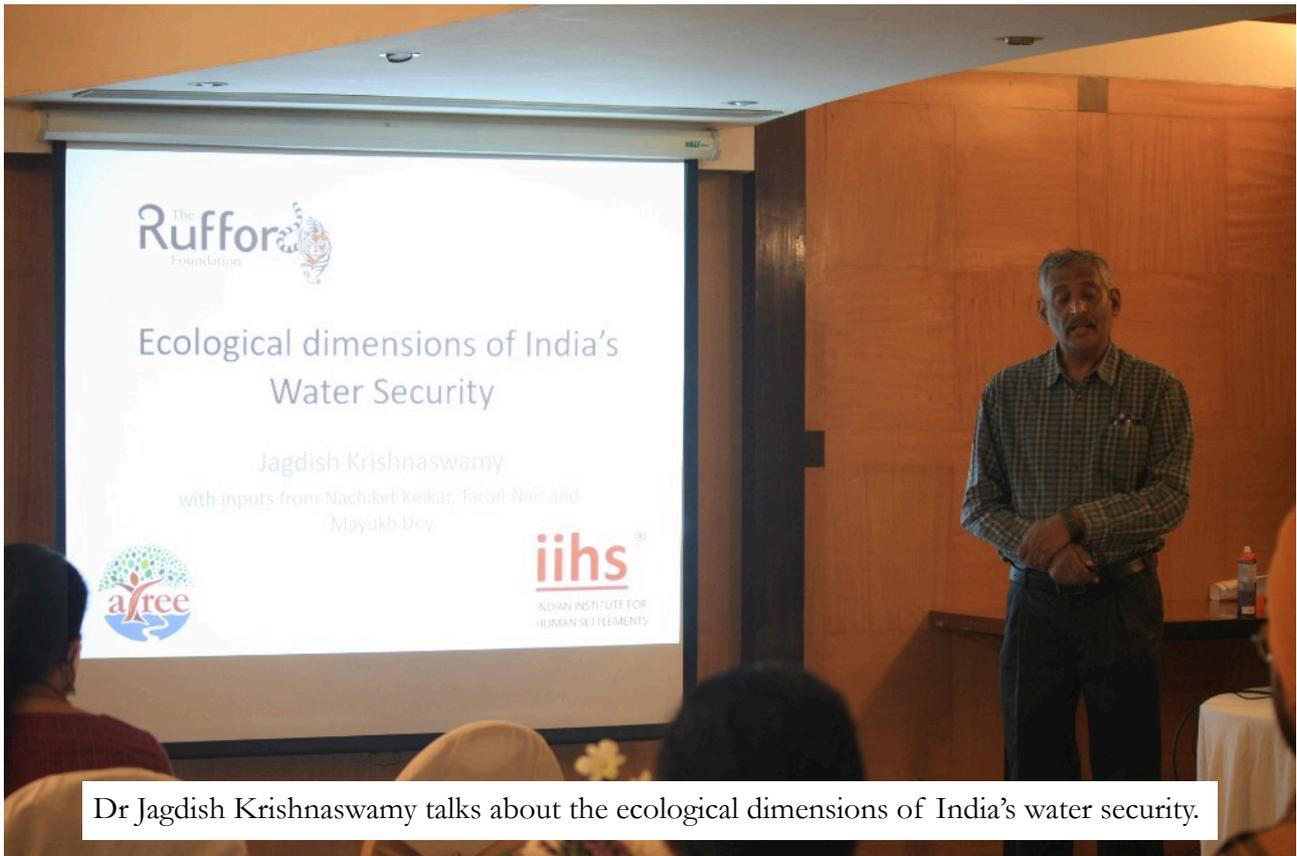
Day 2

The second day began with a plenary talk from Dr Jagdish Krishnaswamy from the Indian Institute for Human Settlements on the ecological dimensions of India's water security. Dr Krishnaswamy began by explaining the water balance and moved on to show how evapotranspiration, an important element in water balance, responds to vegetation changes and how different forest cover impacts hydrology in the Western Ghats.

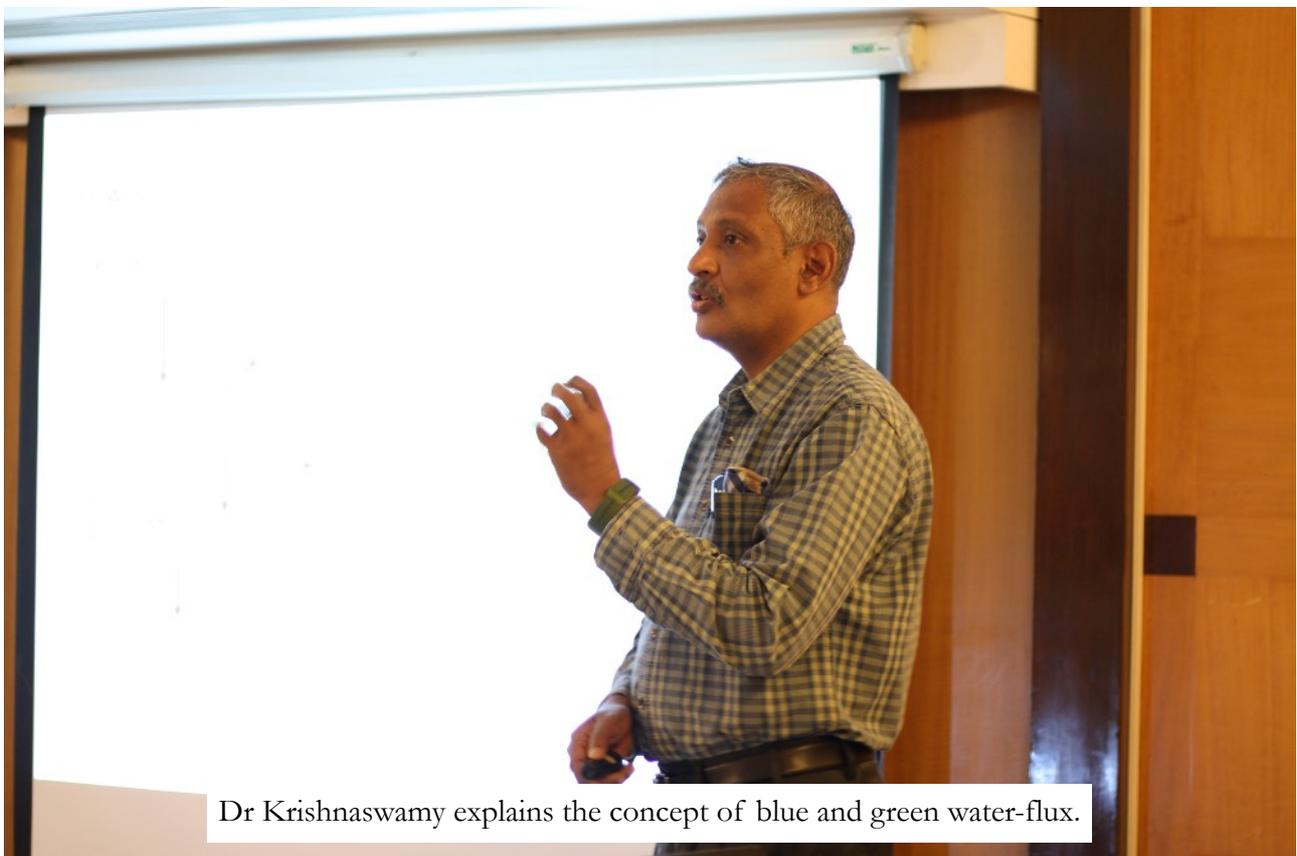
Dr Krishnaswamy explained the concept of blue and green water-flux and how moisture supply from the Western Ghats travels to water deficit areas on the east coast of India (Supantha, et al., 2018). He also spoke about atmospheric aerosol and showed how clouds formed in the eastern Himalayas during spring (Roy et al., 2017) favour low-level cloud formation (Chatterjee et al 2018) potentially triggering more local rain events.

Dr Krishnaswamy concluded by saying that low to moderate reduction in water use in agriculture can make a big difference to river ecology, barrage and dam operations need to be reconsidered to maintain ecological flows, projects that reduce free-flowing rivers and impact dis-

charge to the sea need to be re-looked, and the need for ecological restoration to achieve carbon targets without hydrologic trade-offs.



Dr Jagdish Krishnaswamy talks about the ecological dimensions of India's water security.

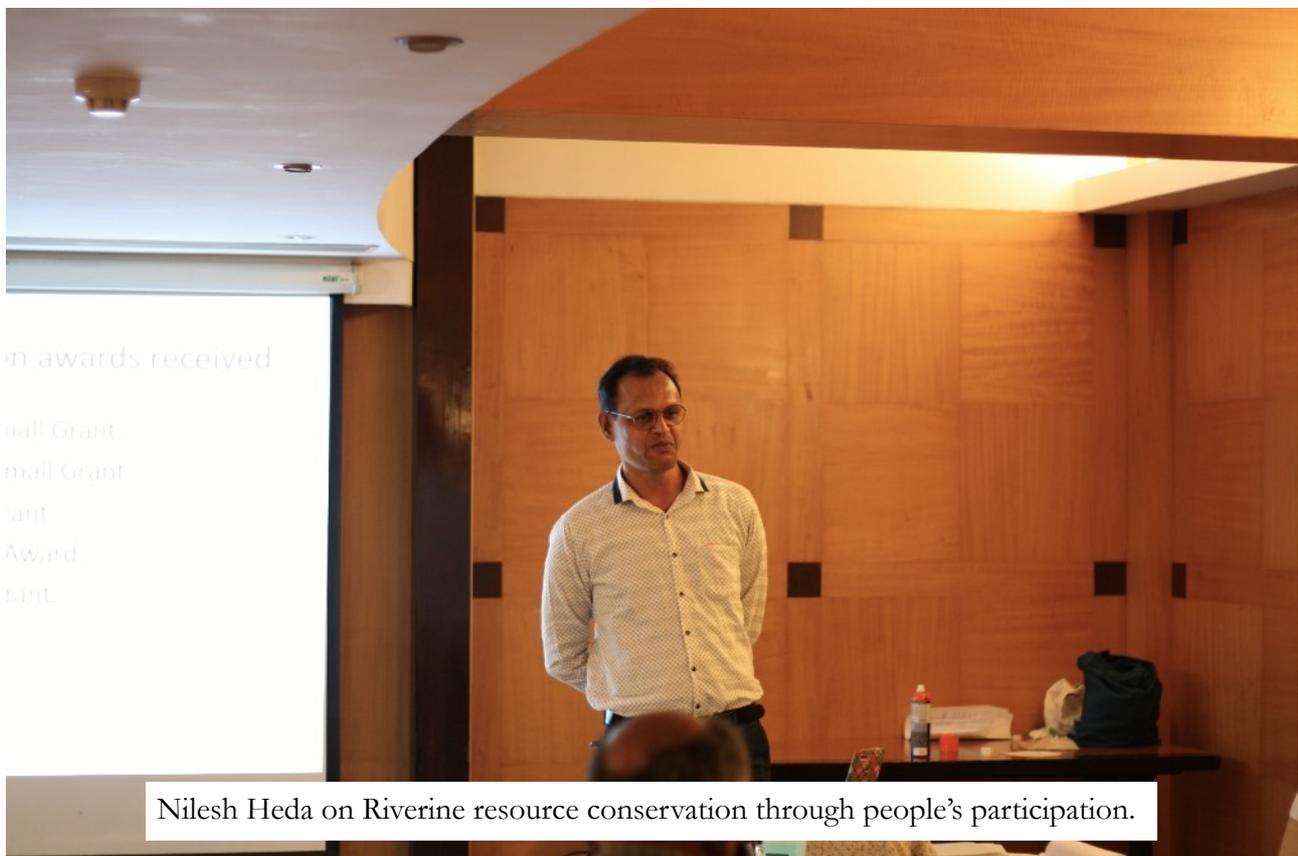


Dr Krishnaswamy explains the concept of blue and green water-flux.

Following Dr Krishnaswamy's talk, participants gave presentations about their respective projects. They spoke about the landscape or species they focused on, what they had achieved so far, threats, gaps in knowledge and what they plan to do in the future. Presentations were for five (speed talks) or fifteen minutes, followed by a question and answer session.

The first grantee to present his work was Nilesh Heda. He spoke about how riverine resources in the Adan and Bembla River Basins, in central India, can be conserved through peoples' participation. Heda has received all five stages of grants offered by Rufford, and he spoke about his journey from beginning of his project until the present day. He has now started a non-government organisation called Samvardhan to continue this work.

Heda emphasised the importance of adopting a holistic approach to riverine conservation. He, himself, adopted a five-pronged approach wherein he first sought to define what is meant by a river, understand the state of the river and use this as a litmus test to understand development in the region, uncover the reason behind this degradation, and conserve the entire basin area by solving wider problems affecting peoples' livelihood, agriculture, forest, grasslands, streams and so on.



Nilesh Heda on Riverine resource conservation through people's participation.

The next talk was by Kannathasan Narasimmarajan who spoke about the status of the *Nilgiris mystus* in the Moyar River of the Western Ghats. Through his study, he found the *Nilgiris mystus* to prefer lower elevation and a run habitat. However, sand mining, illegal fishing, invasive species and hydroelectric projects threaten their survival. In the future, Narasimmarajan wishes to investigate the impact of invasive fish on the *Nilgiris mystus*.

After this, Gaurav Vashista spoke about the threats faced by a breeding gharial population in the Girwa River in Katarniaghat, Uttar Pradesh. The gharial is a critically endangered, freshwater crocodile that uses riverine sandy substrates to nest, but a channel shift in 2010 diverted the water flow from Girwa to Kaudiyala and initiated a gradual succession of sandy areas to a vege-

tated state — resulting in the loss of nesting area, decreased nest numbers, increased egg and hatchling mortality, and consequently lower hatching success.

Through Vashistha's project, he attempted to prevent the loss of breeding sites through vegetation removal and artificial sandbanks. He found that in places where they removed vegetation, roots wrapped around the gharial eggs destroying them and herbivores who came to feed on the young shoots damaged some of the eggs. The damaged eggs then attracted ants. Meanwhile, the artificial sandbanks, which were easier to construct and less time consuming, saw double the nest numbers and significantly increased hatching success. Notwithstanding, Vashistha stressed that for the gharial population to survive, a proper schedule regarding when dams released water was essential so as not to flood the sandbanks.



Gaurav Vashistha on the threats faced by a breeding gharial population in the Girwa River

The Terai region is rich in biodiversity, however, most of the Terai has already been lost to agriculture and urbanisation. Annual flooding is one of the means of maintaining the vegetation and wildlife habitat in protected areas here, but the spread and behaviour of floods are not well understood. Through his analysis, Subham Banerjee found elevation, ruggedness, distance to rivers, and slope had a significant influence on the spatial distributions of floods.

Eurasian otters (*Lutra lutra*) were once considered extinct from central India, but recently small populations have been reported from multiple locations, including the Balaghat district of Madhya Pradesh. Vinny Jain examined otter occurrence and human-otter interactions in this region through questionnaires and occupancy surveys. She found that there are high levels of spatial overlap between humans and otters, with some level of economic loss to households dependent on fishing. Otters in the region were threatened by declining water quality, habitat modifications, hunting, commercial fishing, illegal sand mining, and local superstitions.

Next, Evan Nazareth spoke about his work on the critically endangered giant guitarfish in the

Andaman Islands. Giant guitarfish remain virtually unheard of even though their populations have declined drastically in recent years, and Nazareth's project aimed to bridge some of these knowledge gaps by using local ecological knowledge and habitat surveys. Nazareth mapped the distribution of giant guitarfish across the Andamans and identified juvenile aggregation sites (potential nurseries) where management and conservation action should be focused.

Next, there were four presentations of five minutes each. The first presentation was by Sushmita Kar who worked on the critically endangered Asian brown tortoise (*Manouria emys phayrei*) in Nagaland. Through this project, Kar raised awareness about the Asian brown tortoise by participating in Nagaland's famous Hornbill Festival. She has also advocated raising the status of the species to Nagaland's state reptile. This project is being run alongside Turtle Survival Alliance, India's ex-situ conservation program at Nagaland Zoological Park.

The Kanjli Wetland in Punjab, located along the floodplains of Beas, is known for its floral and avifaunal diversity. Bageshwer Singh carried out a study here to document this diversity and has so far recorded 151 plant species and 2 lichen species along with over 100 species of birds.



Bageshwer Singh on the floristics and avifaunal diversity in Kanjli Wetland, Punjab.

The third speed talk was by Vikram Aditya. Aditya has been assessing the status of the endangered Indian pangolin (*Manis crassicaudata*) in the Eastern Ghats of India. Through camera traps, he reported the presence of pangolins in a majority of the grid cells he surveyed and documented how these animals are caught, used and sold. He even mentioned how prices are quoted over social media.

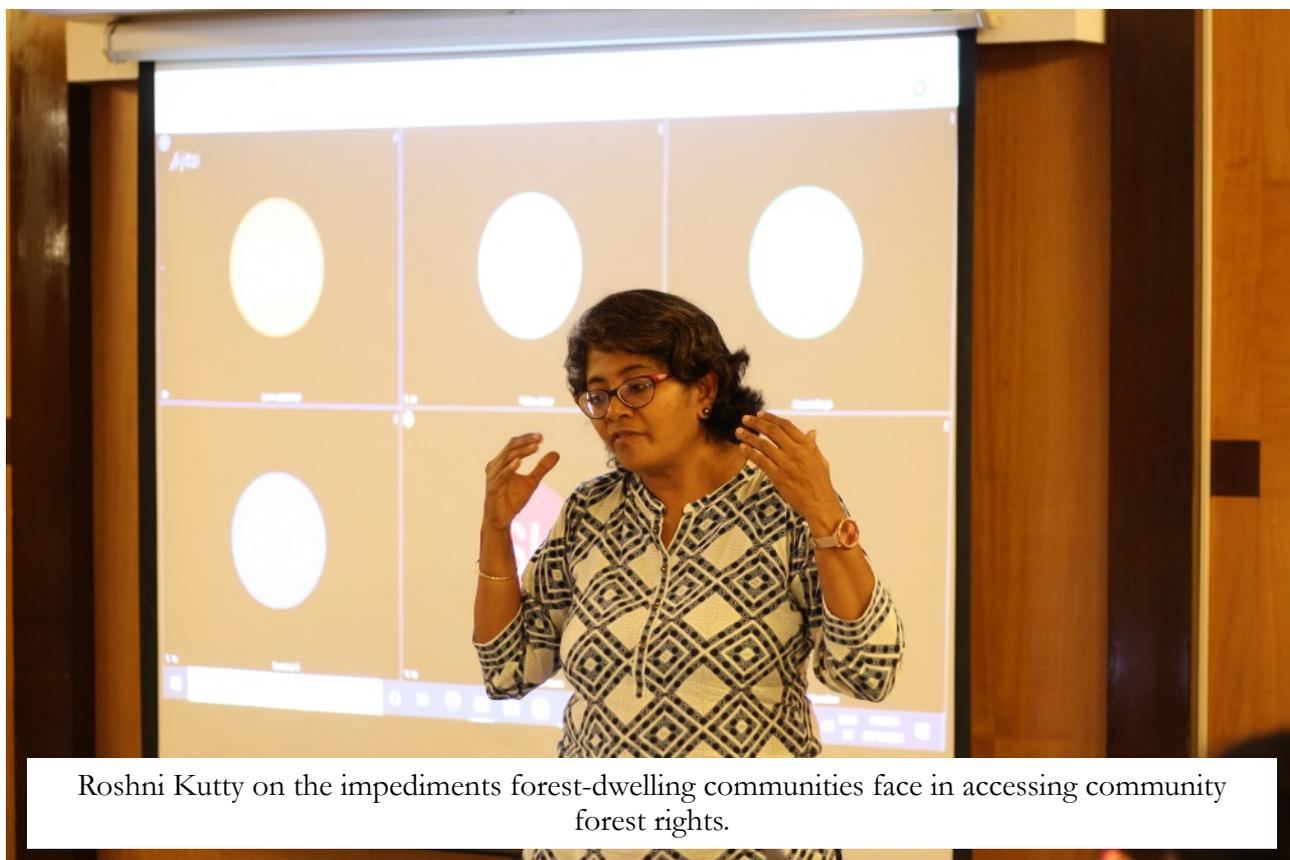
The final speed talk was by Iftikar Ali who surveyed 17 villages in Kargil to assess the level and magnitude of human-carnivore conflict. He has also conducted education outreach programs in 25 schools and formed wildlife nature clubs (WNCs), a group of local youths in villages af-

affected by conflicts, to coordinate between villagers and the administrative departments to deal with wildlife conflict situations.

The next grantee Gaurav Dixit analysed people's perceptions living in the high altitudes of the Indian Himalayas towards leopards to construct effective community-based conservation models. He received a varied group of responses including that some people thought that leopards and other carnivores were left by the forest department to protect the forests from them and questioned if he would be now getting rid of the leopards. Dixit found that low education and lack of awareness further contribute to these beliefs.

Next Vidya Athreya from Wildlife Conservation Society gave a talk on "The joys and perils of wildlife conservation: the case of the leopard and its fans." She spoke candidly about her experiences working in wildlife conservation — how the field had changed since she first began working, how as a biologist she needed to think also about conservation, the lessons she's learnt and the experiences she'd had. She advised young researchers to be open to new information, to read about research in related fields, and to communicate with forest staff and community members and learn from them.

Roshni Kutty, a social scientist, spoke about the impediments forest-dwelling communities face in accessing community forest rights in the Western Ghats of Karnataka. She showed how pre-existing institutions, shaped by the history and geography of the region, have disincentivized claims on forest commons. Her talk was relevant in showing why context-sensitive and flexible approaches backed by an understanding of the region's history are relevant in increasing communities' access to resources as this helps in the ultimate conservation of landscapes.



Roshni Kutty on the impediments forest-dwelling communities face in accessing community forest rights.

Many projects have understood the importance of community participation and citizen science to aid in conservation efforts. Another grantee Nidhi Rana, too, relied on community participa-

tion to assess the status of fireflies in Doon Valley, Uttarakhand. Through her project, Rana documented three genera of fireflies in her study site.

Next, Sarabjeet Kaur Narula, spoke about the distribution of the great slaty woodpecker (*Mulleripicus pulverulentus*) in the Pawalgarh Conservation Reserve and the immediate region outside the protected area. She documented that the population here is represented by 14 groups with a total of 63 individuals occurring in groups of three to seven individuals.

Day 3

On the third day of the conference, participants were taken to the Godrej Mangroves at Vikhroli in Mumbai. Commonly referred to as Mumbai's second lung, the Godrej Mangroves cover an area of 1,750 acres and protect the eastern shoreline of Mumbai from erosion. These mangroves hosts over 1,600 different species of plants, animals, birds and insects. Additionally, these mangroves also sequester around 60,000 equivalent tonnes of carbon dioxide every year.



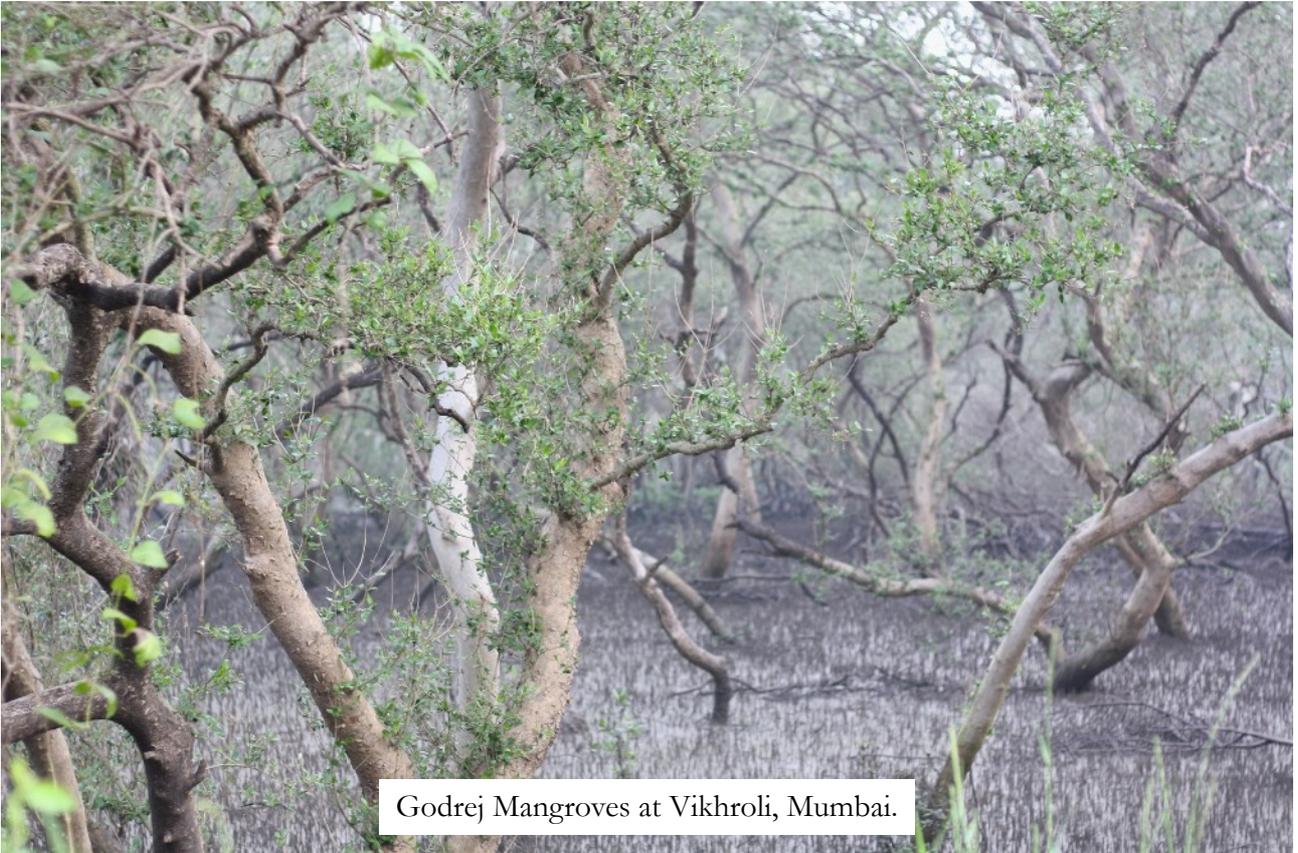
Amar Deshapande, Senior Manager, Godrej Mangroves, introduces participants to mangrove systems.

Once we reached, Amar Deshapande, Senior Manager, Godrej Mangroves, took us on a walk down one of Godrej Mangroves' nature trails. On the way, he showed mangroves and associated plant species and explained the use of these plants. Other researchers familiar with the mangrove systems also discussed about various species and their used to the group.

When we reached the mangrove, Deshapande pointed out the dominant tree species found here and then showed us a small nursery comprising of different mangrove species, such as river mangrove (*Aegiceras corniculatum*), orange mangrove (*Bruguiera cylindrica*) and red mangrove (*Rhizophora mucronata*).



Deshapande points out various trees species associated plant species and explains the uses.



Godrej Mangroves at Vikhroli, Mumbai.

We next went to the medicinal garden where Deshapande showed us various medicinal plants and trees such as Amar grape (*Cissus quadrangularis*) used to treat asthma, bronchitis, cardiac disorders, dyspepsia and burning sensations; Arjun (*Terminalia arjuna*) that gives relief in symptomatic hypertension, acts as a diuretic in cirrhosis of liver and to cure earache; and cardamom (*Elettaria cardamomum*) used in the several pharmaceutical preparations.

We also sighted various butterflies and birds in the mangroves.

Post breakfast, Deshapande told us about the management of these privately owned mangrove property, various research projects carried out by graduate, post-graduate and PhD students; surveys carried out by NGOs and consultants; awareness activities, such as the publication of a Marathi storybook on mangroves; a mobile application to help identify mangrove species; and management and patrolling activities undertaken to prevent encroachment and felling of trees.



Deshapande describes management practices of the Godrej Mangroves.

Following the visit to the mangroves, the participants continued with the presentations of their work. The first talk of the day was by Shanthala Kumar who studied the risk of transmission of gastrointestinal parasites from relocated commensal bonnet macaques to wild ones in southern India. She found when groups were relocated, they weren't always relocated to the same place or in a sustainable sex ratio, disrupting their social dynamics. And the relocated groups had different endoparasites compared to local groups due to eating a different diet. Kumar suggested that such relocations should be avoided, however, if inevitable, the captured animals should be screened and treated for diseases and endoparasites before relocations.

The next two talks were by Ashok Varma and Monica Kaushik who looked at the roost habitat use of harriers in Rajasthan and urban green spaces as a tool for conserving urban avifauna in

Dehradun, respectively. Harriers, standing at the apex of the food chain, are the only group of predatory birds that roost and nest on the ground, and India supports the largest harrier roost in the world. Varma attempted to protect harriers and their roost habitat by identifying threats to these birds and by creating awareness material for communities. Meanwhile, Kaushik found that the size of the urban green space and tree species richness emerged as important predictors influencing bird species richness and density.

The next four talks were speed talks. The first was by Bismay Ranjan Tripathy who assessed the trends of human-elephant conflict in Keonjhar forest division. He found the intensity of human death and injury, and house damage had declined over the 18 year period, and that crop damage was the most frequent form of conflict that intensified post-2009, especially during the winter months.

The second speed talk by Durga Prasad Srivastava was about another species that has begun to move through human-use areas — Bhopal’s urban tigers. Srivastava studied how these tigers interacted with humans and found that they have now become residents in the green spaces in and around Bhopal without causing any direct conflict with humans, by moving mainly after dark.

The third talk by Dincy Mariyam looked at why tourists entered protected areas and what their viewing preferences were. She found that people were most keen on sighting a tiger, followed by other large mammals and landscapes, and birds. Tourists least preferred to view plants and trees, and herpetofauna. Mariyam also found that younger tourists who support conservation viewed lesser-known species such as herpetofauna better.

The fourth speed talk was by Joyeeta Singh who studied pollinators’ abundance and interaction ecology, and raised awareness among communities and carried out a six-month ‘pollinator photography contest’.



In the final talk of the day, Vijay Ramesh spoke about the use of acoustics to evaluate the effectiveness of forest restoration in the Western Ghats. Here, degraded rainforest fragments have been ecologically restored in a landscape dominated by tea and coffee plantations. Ramesh found that in rainforest bird species richness was highest in benchmark sites, intermediate in active restoration sites, and lowest in natural regeneration areas. However, open-country bird species richness was least in benchmark sites, intermediate in active restoration, and highest in natural regeneration.

Next Abhishek Jamalabad, from Marine Life of Mumbai, gave a talk about Mumbai's intertidal zone. This project began as a group of amateur enthusiasts exploring the intertidal zone of Mumbai. With the help of a marine researcher they then began documenting the species they encountered on iNaturalist and so far, 77 people have documented 4,644 observations of 483 species. As the groups grew and they began conducting regular shore walks many more people from different areas of expertise joined, such as artists and writers who began using their skills to raise awareness about Mumbai's intertidal zone. After about 5 years, Abhishek Jamalabad, Pradip Patade a former water sports instructor and marine ecology enthusiast, and Siddharth Chakravarty a former seaman and an academic researcher co-founded the Coastal Conservation Foundation to continue their journey raising awareness about marine life on Mumbai's intertidal zone.



DAY 4

This day began with a talk by a scientist from Bombay Naturalist History Society Tuhina Katti, who spoke about bird ringing and its relevance for conservation. Katti touched upon how and why birds are tracked — to understand their behaviour and physiology, the spread of disease, and its conservation implications.

Interestingly, India has three international flyways passing over it, and birds ringed in India have been recovered in 29 countries spread over five continents (Asia, Africa, Europe, Australia, Antarctica). Katti also explained how birds are measured when they're recaptured and the other devices used to track birds.



Following this, there were four presentations of 15 minutes each. The first presentation was by Deyatima Ghosh who studied the cognitive abilities of animals and how this can be used in biological pest regulation. Against the backdrop of an increase in arable land and the amount of food produced, there is a lack of understanding of the efficiency of pest regulation by natural enemies as crucial factors which determine how predators learn, find and remember food sources are not considered. Her study will help reduce the use of pesticides and pest outbreaks, increase crop health, and terrestrial and aquatic diversity, among other benefits.

The next talk was by Tijo K. Joy, who looked at the population, ecology and conservation status of Salim Ali's fruit bat (*Latidens salimalii*) in Munnar. Salim Ali's fruit bat is considered one of the three rarest bats in the world and is endemic to south India. Joy's study was the first to report this bat in Kerala and to provide information on its population, ecology and foraging habits here.

After this, Sayan Banerjee presented his work analysing how humans and wild elephants interact in a forest-agriculture-plantation landscape in Assam. Here, he found that elephants use riverine areas and patches within tea estates as conduit sites. They rest here during the day and are often driven back if they try to leave during this time. Farmers, here, prefer using solar fences as deterrents against the elephants over other means.

The last talk was by Sanjay Sondhi. Sondhi had received two Rufford grants to carry out Lepidopteran research and conservation in the Kameng Protected Area Complex, Arunachal Pra-



desh. At the end of the project, he continued to support this work and has now worked in this region for 10 years. Looking back at his journey, he narrated how people barely paid attention to Lepidoptera. But as time passed and new records of butterflies and moths began to emerge, these species began to be the centre of focus for tourists, the forest department and local communities. This has also helped improve the capacity of local communities who now generate their livelihood from these activities.

Issues raised and recommendations made by participants

During the conference many of the participants expressed their concern regarding the requirement of having an institutional affiliation to receive Rufford grants. Over the last few years The Rufford Foundation has made it mandatory for the grantees to have an institutional affiliation to receive funds. This requirement has posed problems for researchers in finding a suitable institution and getting an affiliation with them. It had created unnecessary delays in receiving funds. Also allocating overheads, which is a norm in most of the institutions, has been a major issue for the grantees.

Grantees also suggested to conduct skill development, leadership development, and presentation skill workshops either as a part of the conference or as a separate event. In the future, we plan to conduct such workshops for grantees in India.

Appendix 1: List of participants

Sl. No	Name	Email address	Organization	Mode of Participation
1	Ashok Verma	vermaasok@rediffmail.com	Society For Research In Ecology And Environment	In-person
2	Bageshwer Singh	bageshwersingh30@gmail.com	Pahal Jalandhar	In-person
3	Bismay Ranjan Tripathy	bismaytripathy@outlook.com	Tsinghua University, Beijing, China	In-person
4	Deyatima Ghosh	dgzoo_rs@caluniv.ac.in	Ashoka Trust For Research In Ecology And The Environment (Atree)	In-person
5	Dincy Mariyam	dincy.mariyam@cw-sindia.org	Centre For Wildlife Studies, Bengaluru	In-person
6	Durga Prasad Srivastava	dpsrivastava1992@gmail.com	Wildlife Institute Of India	In-person
7	Evan Nazareth	evannaz@hotmail.com	Nature Conservation Foundation	In-person
8	Gaurav Dixit	gaurav.dixit.a1@gmail.com	Czech University Of Life Science, Prague, Cz	In-person
9	Gaurav Vashistha	gaurav.vashistha91@gmail.com	Department Of Environmental Studies, University Of Delhi	In-person
10	Kannathasan Narasimmarajan	wildlife9protect@gmail.com	Madras Christian College	In-person
11	Monica Kaushik	monica.monica@fulbrightmail.org	Ambedkar University Delhi, Delhi	In-person
12	Nidhi Rana	kuku.nidhi66@gmail.com	Wildlife Institute Of India	In-person
13	Nilesh Heda	nilheda@gmail.com	Samvardhan Samaj Vikas Sanstha	In-person
14	Ravi Jambhekar	ravijambhekar04@gmail.com	Indian Institute Of Science	In-person
15	Roshni Kutty	roshni.kutty@atree.org	Ashoka Trust For Research In Ecology And The Environment (ATREE)	In-person

16	Subham Banerjee	sb16rs005@iiserkol.ac.in	IISER Kolkata	In-person
17	Sushmita Kar	sushmitakar123@gmail.com	Turtle Survival Alliance Foundation India	In-person
18	Tijo K Joy	tijokjoyz@gmail.com	United Nations Development Programme (UNDP)	In-person
19	Vinny Jain	vinni.jain@cwsindia.org	Centre For Wildlife Studies, Bengaluru	In-person
20	Rajat Ramakant Nayak	rajat@feralindia.org	Foundation for Ecological Research, Advocacy and Learning	In-person
21	Nicole Pinto	nicole@feralindia.org	Foundation for Ecological Research, Advocacy and Learning	In-person
22	Venetia Sharanya	venetia@feralindia.org	Foundation for Ecological Research, Advocacy and Learning	In-person
23	Sandeep G	sandeep@feralindia.org	Foundation for Ecological Research, Advocacy and Learning	In-person
24	Dr. Jagdish Krishnaswamy	jk Krishnaswamy@iihs.ac.in	Indian Institute for Human Settlements	In-person
25	Tuhina Katty	tuhina.katti@gmail.com	Bombay Natural History Society	In-person
26	Abhishek Jamalabad	abhishek.jamalabad@gmail.com	Marine Life Mumbai	In-person
27	Dr. Vidya Athreya	vidya.athreya@gmail.com	Wildlife Conservation Society-India	Virtual
28	Srinivas Vaidyanathan	srinivasv@feralindia.org	Foundation for Ecological Research, Advocacy and Learning	Virtual
29	Vikram Aditya	vikram.aditya@atree.org	Ashoka Trust For Research In Ecology And The Environment (ATREE)	Virtual
30	Iftikar Ali	iftida7@gmail.com	University of Salford	Virtual
31	Sarabjeet Kaur Narula	23tanyanarula@gmail.com	Wildlife Institute Of Indai	Virtual

32	Shanthala Kumar	shaanyk@gmail.com	Independent	Virtual
33	Joyeeta Singh	joyeeta.u@gmail.com	Forest Research Institute	Virtual
34	Vijay Ramesh	vr2352@columbia.edu	Columbia University	Virtual
35	Sayan Banerjee	sayan.workspace@gmail.com	National Institute of Advanced Studies, Bengaluru	Virtual
36	Sanjay Sondhi	sanjay.sondhi1@gmail.com	Titli Trust	Virtual
37	Dr. Haripriya Gundimeda	haripriya.gundimeda@iitb.ac.in	Indian Institute of Technology, Bombay	Virtual

Appendix 2: Schedule

6 December, 2021

Time	Event
14.00 – 15.00	CHECK IN, REGISTRATION and LUNCH
15.10 – 15.15	WELCOME ADDRESS Srinivas Vaidyanathan Senior Scientist, Trustee, Foundation for Ecological Research, Advocacy and Learning
15.15 – 16.00	INTERACTIVE SESSION
16.00 – 17.00	PLENARY TALK Prof. Haripriya Gundimeda Indian Institute of Technology <i>Integrated framework for evaluating externalities from agriculture</i>
17.00 – 17.15	HIGH-TEA
17.15 – 17.45	ORAL PRESENTATION Ravi Jambekar <i>Art, conservation, and experiences from the field</i>
20.00 – 22.00	DINNER

7 December, 2021

TIME	EVENT
08.30 – 09.00	REGISTRATION
09.00 – 10.00	PLENARY TALK Dr. Jagdish Krishnaswamy Indian Institute for Human Settlements <i>Ecological Dimensions of India's Water Security</i>
10.00 – 10.30	TEA BREAK
	ORAL PRESENTATIONS (15 + 3 minute)
	Nilesh Heda <i>Riverine resource conservation through people's participation Case study from Maharashtra state of India</i>
	Kannathasan Narasimmarajan <i>Perished or persisted: status of Nilgiris mystus in river Moyar, Western Ghats biodiversity hotspot</i>
	Gaurav Vashista <i>A dam damned the Gharial</i>

10.30 – 13.00	Jayanta Kumar Roy <i>Effect of forest management on amphibians as indicator to ecosystem health in the Dibang River Basin, Arunachal Pradesh, India</i>
	Subham Banerjee <i>Elevation and rivers have dominant influence on spatial-temporal patterns of floods in a species-rich protected Terai habitat in north-eastern India</i>
	Vinny Jain <i>Examining otter occurrence and human-otter Interactions across a tropical forest landscape in Central India</i>
	Evan Nazareth <i>The Giant Guitarfish Project</i>
13.00 – 14.00	LUNCH
14.00 – 15.00	SPEED TALKS (5 + 3 minute)
	Sushmita Kar <i>Building road to recovery of Asian brown tortoise (<i>Manouria emys phayrei</i>) in Nagaland, Northeast India</i>
	Bageshwer Singh <i>A preliminary study on floristics and avifaunal diversity in Kanjli Wetland, Punjab, India</i>
	Vikram Aditya <i>Integrating camera traps and community knowledge to assess the status of the endangered Indian pangolin in the Eastern Ghats, India (virtual presentation)</i>
	Iftikar Ali <i>Extending Wildlife Conservation approach in Kargil (Ladakh) Trans-Himalayas, India (virtual presentation)</i>
	ORAL PRESENTATION (15 + 3 minute)
15.00 – 15.45	POPULAR TALK Dr. Vidya Athreya Wildlife Conservation Society <i>The joys and perils of wildlife conservation: the case of the leopard and its fans</i>
	TEA BREAK
16.15 – 17.15	ORAL PRESENTATIONS (15 + 3 minute)
	Roshni Kutty <i>Understanding the impediments in implementing community forest rights in a biodiversity hotspot: Western Ghats of Karnataka, India</i>
	Nidhi Rana <i>Assessing the status of fireflies and its conservation practices through community participation in Doon Valley, Uttarakhand, Western Himalaya</i>
	Sarabjeet Kaur Narula <i>Status of <i>Mulleripicus pulverulentus</i> – the largest woodpecker in Pawalgarh Conservation Reserve (virtual presentation)</i>

8 December, 2021

TIME	EVENT
06.00 – 13.30	FIELD TRIP Mangroves and Creeks
13.30 – 15.00	LUNCH
15.00 – 16.00	ORAL PRESENTATIONS (15 + 3 minute)
	Shanthala Kumar <i>Risk of gastrointestinal parasite transmission from relocated commensal bonnet macaques to wild animals in southern India</i> (virtual presentation)
	Ashok Verma <i>Roost habitat use of barriers in Rajasthan</i>
	Monica Kaushik <i>If you built it, they will come: urban green spaces as a tool for conserving urban avifauna</i>
16.00 – 16.20	TEA BREAK
16.20 – 17.10	SPEED TALKS (5 + 3 minute)
	Bismay Ranjan Tripathy <i>Assessing the trends of human elephant conflict in Keonjhar forest division, India using spatial-temporal analysis</i>
	Durga Prasad Srivastava <i>Bhopal's urban tigers: understanding tigers and their interactions with humans in Bhopal, Madhya Pradesh, India</i>
	Dincy Mariyam <i>Examining nature-viewing preferences of tourists visiting three popular Indian protected areas</i>
	Joyeeta Singh <i>Post-outreach feedback response: excerpts from 'pollinator photography contest' in and around Kedarnath Wildlife Sanctuary in Uttarakhand Himalaya</i> (virtual presentation)
17.10 – 17.30	ORAL PRESENTATION (15 + 3 minute)
	Vijay Ramesh <i>Conservation through sounds: Using acoustics to evaluate the effectiveness of forest restoration</i> (virtual presentation)
17.30 – 18.10	POPULAR TALK Abhishek Jamalabad Marine Life of Mumbai, Coastal Conservation Foundation <i>Life of Mumbai: Charting biodiversity in a transforming urban seascape</i>

9 December, 2021

TIME	EVENT
09.00 – 09.45	POPULAR TALK Tuhina Katti Bombay Natural History Society <i>Bird ringing studies and its relevance for conservation</i>
09.45 – 10.00	TEA BREAK
10.00 – 11.30	ORAL PRESENTATIONS (15 + 3 minute)
	Deyatima Ghosh <i>How animals do what they do? Role of learning in biocontrol</i>
	Tijo K Joy <i>Population, ecology and conservation status of Salim Ali's fruit bat (Latidens salimalii) in Munnar landscape</i>
	Sayan Banerjee <i>Understanding human-elephant interaction at a landscape mosaic in Assam, India (virtual presentation)</i>
	Sanjay Sondhi <i>Assessing the Conservation and Livelihood impact of Lepidopteran Research in the Kameng Protected Area Complex, Arunachal Pradesh, India (virtual presentation)</i>
11.30 – 11.45	CONCLUDING REMARKS and CHECK– OUT
12.00 – 14.00	LUNCH

Appendix 2 - Abstracts

Art, conservation, and experiences from the field - Ravi Jambekar

A fundamental question in ecology is to understand how a species is distributed across a landscape. Island biogeography theory, modified for terrestrial landscapes, proposes that the size and isolation of habitat patches and matrix properties should drive population density patterns. Yet, given the same set of landscape features, why do species from a single taxon vary so widely in their density patterns? A primary hypothesis proposed by community-level studies is that key ecological traits of species influence how they respond to landscape features. However, robust tests of this hypothesis which require population-level measurements are scarce.

We investigated the ability of two important ecological traits: habitat specialism/generalism and matrix resistance, to predict the population responses of butterfly species to patch size and connectivity in naturally heterogeneous tropical forest-grassland complexes. We surveyed 56 habitat patches in a 65 sq. km area by laying 276 transects and identified and recorded the abundances of butterfly species. We also used transects cutting across two habitats to estimate matrix resistance. We found habitat specialisation at both microhabitat and habitat scales to clearly predict the strength of area-density and isolation-density relationships. Matrix resistance also predicted variation in area-density relationships, highlighting the importance of species interactions with the matrix. Specialists showed higher matrix resistance and stronger area and isolation effects than did generalists.

Our findings suggest that investigating how traits related to ecological specialisation and matrix resistance affect demographic parameters and can contribute towards understanding the mechanisms underlying species distributions in heterogeneous landscapes.

Riverine resource conservation through people's participation: Case study from Maharashtra State of India - Nilesh Heda

Freshwater wetlands of India are rich repositories of biodiversity and are crucial for the livelihood and survival of millions of people. Unfortunately, these vital ecosystems are facing serious threats from development activities and basin-area degradation and are disappearing from the landscape at an alarming rate. The cascading effects of this ecological meltdown are directly felt by local resource-dependent communities.

The Adan and Bembla rivers of Central India are the part of Godavari basin, the largest basin of Southern India. For a decade, we are working in these basins for eco-restoration and fish conservation by linking employment generation for rural people.

The present paper will portray a case study of the rejuvenation of rivers and other lentic ecosystems by using a holistic ecosystem approach. Every river basin is dotted with villages where scarcity of employment is a major issue. Using the Employment Guaranty Act, the culture of indigenous fishes and other agriculture-based income generation avenues, we have started systematic attempts to revive wetland by involving fishermen, labour and farmers. A systematic study of the selected village has been performed based on the priority issues of local people and eco-restoration activities using labour potential started in the river basin. As a short-term outcome of this initiative people's livelihoods improve and as a future outcome the condition of the local wetland resources including fishes ameliorated substantially. The attempt proved that there is a serious need to link employment generation of local people, rejuvenation of local decision-making, and conflict resolution systems and conservation.

Perished or persisted: status of Nilgiris mystus in river Moyar, Western Ghats biodiversity hotspot - Kannathasan Narasimmarajan

The Nilgiri mystus (*Hemibagrus punctatus*) is a critically endangered fish species, once thought to have gone locally extinct from the Western Ghats biodiversity hotspot region of peninsular India. However, historical records and a few recent survey efforts have re-established the presence of this species, not only in the Moyar River but also in other man-made reservoirs of Tamil Nadu. Our study contributes to the current threatened status of the Nilgiri mystus over three seasons in Moyar River flowing in the protected areas of Tamil Nadu in the southern Western Ghats. Additionally, we also provide a detailed account of native fish diversity, size class distribution of major fish species along with associated anthropogenic threats to the fish fauna.

Our result demonstrates, a healthy population of the Nilgiri mystus in three locations i.e. Jakilikadavu, Boothypatty and Pallamarapatty along the Moyar River. The Nilgiri mystus shows a high preference towards the run habitat rather than the riffle or the pool habitat and was also strongly associated with habitats containing a substrate composition of sand, rocks and pebbles.

Due to the reduced flow downstream of the dam, most of the riverine habitat becomes highly fragmented during the lean season (summer) affecting native fish diversity, and currently, there is no species recovery plan for any of these endemic and threatened fishes. Future studies should be carried out on estimating the flow-ecology relationship for certain common and threatened fish species and prioritise sites based on species composition rather than fish species richness.

A dam damned the Gharial - Gaurav Vashistha

The gharial is a critically endangered, freshwater crocodile. It uses riverine sandy substrates to nest. A breeding gharial population resides in about a 20 km stretch of the Girwa River in Katarniaghat, upstream of Girijapuri barrage. Long term assessment (1975–2020) revealed that population size increased from 14 to 72. However, the population is skewed towards adults with a low recruitment rate of small-sized animals. LANDSAT satellite data-based EVI trends showed that the gharial habitat was dynamic with a regular erosion-deposition process until a channel shift in 2010 diverted the water flow from Girwa to Kaudiyala and initiated a gradual succession of sandy areas to vegetated state.

The vegetational succession resulted in loss of nesting area, decreased nest numbers, increased egg and hatchling mortality, and consequently decreased hatching success. Artificial sandbanks and vegetation removal were tested to reverse the vegetation effects. Artificial sites almost doubled the gharials' nest numbers and significantly increased the hatching success. Egg incubation temperature during nesting determines the viable development, sex and other traits in hatchlings which affects the hatching success and hatchling survival. Consequently, the hatchling recruitment and population structure are influenced by nesting site selection.

Girwa population is restricted above the barrage with possible flushing downstream during the floods. They are unable to re-enter the resident population due to incapability for terrestrial locomotion. Rapidly degrading nesting habitat will eventually impact the breeding because in-situ restoration such as artificial sites are not an effective long-term solution. Indo-Nepal landscape management intervention is imminently required for Girwa gharial population.

Effect of forest management on amphibians as indicator to ecosystem health in the Dibang River Basin, Arunachal Pradesh, India - Jayanta Kumar Roy

This study was conducted to understand the effect of different forest management activities on amphibian species diversity at the Lower Dibang Valley with special reference to secondary habitat conservation. Time constrained visual encounter surveys (VES) were conducted for anurans followed by opportunistic observations during the study period. We compared the species diversity from three land-use/land-cover types explaining the available habitats and the importance of secondary forest in recolonising anuran species during the course of study. Interestingly, anuran diversity measured from secondary/abandoned jhum and primary forest areas were found to be relatively equal (Shannon index; H: 2.77 and 2.76). The highest percentage of unique species was recorded from primary forest followed by secondary/abundant jhum and agriculture/settlement areas. However, secondary/abandoned jhum areas provided refuge for most anuran species normally inhabiting primary forests. We found beneficial human interaction along with secondary succession for creating habitat heterogeneity in secondary/abundant forest, and thus supports maximum anuran breeding habitats and species diversity in secondary/abundant jhum areas. Hence, secondary/abundant habitats were also important for anuran habitat conservation along with primary forests. Five new distribution records for Arunachal Pradesh and one genus *Oreolalax* was recorded for the first time from India. Further, a rare report on *Theloderma moloch* and *Rhacophorus tuberculatus* from northeastern India provided significant information on species microhabitat and updated the amphibian distribution records from Arunachal Pradesh.

Elevation and rivers have dominant influence on spatial-temporal patterns of floods in a species-rich protected Terai habitat in north-eastern India - Subham Banerjee

The Terai ecoregion of the Himalayan foothills is situated at the floodplains of the rivers sourced from the Himalayas. Most of the Terai has already been lost to agriculture and urbanisation, and the few remaining native habitats are strictly protected due to their high biodiversity and ecological importance. During the monsoon months from June to September, the Terai experiences flooding and inundation. This annual flooding is one of the means of maintaining the vegetation and wildlife habitat in these protected areas. Floods are initiated by in spate with bank-full discharges of Terai rivers, but their eventual spread and behaviour are not well understood. We hypothesise that distributions of flood are determined by several direct and indirect drivers like elevation, slope, distance to the river, and climatic attributes of precipitation and temperature. Using the Sentinel-1 SAR based images we tried to understand the spatial and temporal pattern of flooding over 8 years (2014-2021) in Manas National Park of Assam, in north-eastern India. Using spatial and spatial-temporal binomial regression models in a rigorous conditional autoregressive Bayesian framework, we found that elevation, ruggedness, distance to rivers, and slope had a significant influence on the spatial distributions of flood. The climatic signal on inter-annual variation in flood was strong, monthly rainfall increased inundation extent. Through long-time inundation, grasslands are maintained and do not get converted to forests. The year-wise disproportionate distribution of flood needs to be understood and should be compensated with other means (like more fires in drought years where grasslands are not inundated) in grassland management.

Examining otter occurrence and human-otter interactions across a tropical forest landscape in central India - Vinny Jain

Eurasian otters (*Lutra lutra*) were once considered extinct from central India, but recently small and possibly disjunct populations have been reported from multiple locations, including the

Balaghat district of Madhya Pradesh. To prevent the extirpation of such data-deficient populations occurring outside protected areas, it is essential to generate detailed distribution maps and understand how otters and local communities coexist. Our study focuses on otter populations across a 3,300 sq. km. landscape in Balaghat district, consisting of dense forests interspersed with rural settlements. We conducted 551 questionnaire surveys with local people to examine attitudes towards otters, potential threats, and the nature of human-otter interactions. To analyse fine-scale distribution, we used an occupancy framework to sample 81, 5-km river transects, using scat and tracks as an indicator of presence. Naïve occupancy across the rivers was 86.4 percent. Our results indicate high levels of spatial overlap between humans and otters, with otters causing moderate levels of economic loss to households dependent on fishing. Fishing was linked to negative attitudes towards otters, while a high frequency of encounters was linked to positive attitudes. We expect otter habitat use to be influenced by stream order, stream width, land use, and human activities such as fishing and dam construction. Our data indicates that the major threats to otters in Balaghat are declining water quality, habitat modifications, hunting, commercial fishing, illegal sand mining, and local superstitions. Our final results will help form the basis of a management framework for otters across human-modified landscapes.

The giant guitarfish project - Evan Nazareth

This project focused on a critically endangered species of which we know very little about. Giant guitarfish are relatives of sharks and rays, but unlike their relatives, they remain virtually unheard of even though their populations have declined drastically in recent years. In addition to this, our lack of biological and ecological knowledge on these elusive marine species have restricted our ability to effectively conserve them.

We aimed to bridge some of these knowledge gaps by using local ecological knowledge and habitat surveys to better understand the distribution and habitat use patterns of giant guitarfish in the Andaman Islands. In doing so, this project has provided the first insights into the species' biology and ecology from the region. Our results show that the Andaman Islands have the potential to serve as a safe haven for this rapidly declining species. However, prompt and effective conservation measures need to be set in place for this to happen.

Building road to recovery of Asian brown tortoise (*Manouria emys phayrei*) in Nagaland, Northeast India - Sushmita Kar

The Asian brown tortoise (*Manouria emys phayrei*) is the largest and most primitive genus of all tortoises found in Asia. Owing to its incessant decline across its distributional ranges due to over-exploitation and unsustainable consumption by local communities, it is listed as 'critically endangered' in the Red-list, recommending it as a species of high conservation priority. With a broader goal to establish a viable population of *M. e. phayrei* across its historical habitats, this project has been documenting the species' extant population and potential habitats/release sites through field surveys and habitat mapping in two areas in Nagaland to inform future reintroductions. Apart from this, as a measure to ameliorate insidious threats at intended release sites, a strong participatory approach has been devised through educational and community awareness programs, such as promoting the species as a regional mascot. Furthermore, conservation agreements with ethnic village committees are on the immediate horizon. This project is being run alongside Turtle Survival Alliance, India's ex-situ conservation program at Nagaland Zoological Park, to expand breeding facilities and strengthen the regional conservation network and capacity. The future goal is to pilot release and monitor 10 radio-tagged head-started juveniles from the assurance colony at NZP in early 2022.

A preliminary study on floristics and avifaunal diversity in Kanjli Wetland, Punjab, India - Bageshwer Singh

The Kanjli wetland, a Ramsar site and an important bird area, is located along the floodplains of Beas. Known for its floral and avifaunal diversity, the wetland is an important hotspot for biodiversity in the region. Therefore, we conducted a preliminary survey, the first of its kind in any wetlands of Punjab. The survey aimed to assess the floristic and avian diversity of aquatic and terrestrial habitats in the wetland, identify high-risk areas of plant invasion, threats to the waterfowl habitat and mitigation measures. In the preliminary analysis, 151 plant species and 2 lichen species belonging to 129 genera and 57 families along with >100 species of birds were recorded, including migrant waterfowl and IUCN red-list species such as woolly necked stork, bar headed geese, northern pintail and garganey. In flora of the region, Fabaceae was the dominant family (15 species) followed by Asteraceae (11 species) and Poaceae (10 species). *Ficus* represented the dominant genera, 19 species were invasive alien species that dominated the wetland. The current study revealed that due to the abundance of invasive plant species, human encroachments, and other anthropogenic pressures, the wetland faces serious threats. Unfortunately, due to the expansion of agriculture and urbanisation in Punjab plains, the forested and natural spaces which provide refuge to many avifaunal species are limited to a few sporadic areas, predominantly along the rivers and wetlands such as Kanjli.

Integrating camera traps and community knowledge to assess the status of the endangered Indian pangolin in the Eastern Ghats, India - Vikram Aditya

Hunting, consumption of wild meat and illegal wildlife trade are key threats to biodiversity leading to the extirpation of threatened species. The pandemic has highlighted the dangers of infectious disease spillovers from wild animals to humans due to hunting and the possible role of trafficked pangolins as intermediate hosts of the COVID-19 virus. Pangolins are the most trafficked and are among the most threatened species globally. The Indian pangolin (*Manis crassicaudata*) that occurs across peninsular India is listed as an endangered species by the IUCN. We surveyed 750 sq. km. of the northern Eastern Ghats landscape for the presence of the Indian pangolin using camera traps. We also conducted 60 semi-structured interviews with people who were engaged in pangolin hunting in 30 villages around Papikonda National Park. Interviewees reported the presence of pangolins in a majority of the grid cells that we surveyed with camera traps, particularly in moist deciduous forests distant from villages. Camera traps did not detect pangolins in 840 trap-days. Hunting of pangolins for their meat and for their scales is most likely the reason for the rarity of the species in the Eastern Ghats.

Extending wildlife conservation approach in Kargil (Ladakh) Trans-Himalayas, India - Iftikar Ali

Various factors lead to human-wild carnivore conflicts. The exponential and rapid growth of the human population has resulted in encroachment of wildlife habitats and over-exploitation of natural resources around the globe. In Kargil (Ladakh), India, studies have been undertaken to understand the drivers and patterns of such conflicts. Snow leopards, Tibetan wolves, Himalayan brown bears, foxes, and feral dogs have been reported to predate on livestock and damage human property. In 2015, we initiated a project to extend community-based wildlife conservation in this region. We surveyed 17 villages in Kargil to assess the level and magnitude of human-carnivore conflicts and conducted wildlife awareness programs in those villages. Education outreach programs were conducted in 25 schools across the district and the formation of wildlife nature clubs (WNCs), a group of local youths in villages affected by conflicts, was

initiated. The main motive behind the formation of WNC was to coordinate between the villagers and the concerned administrative departments to deal with wildlife conflict situations. Being a first and a major project of its kind in Kargil, the project was welcomed by the district administration and the local communities of the region. Further studies are being carried out in the region to understand the people's perception of wild carnivores and formulation of a concrete conservation action plan for the region.

Assessing perception of the local community towards leopards in order to construct effective community-based conservation models - Gaurav Dixit

Owing to the current trend of rapidly increasing human infrastructural development across the globe, wildlife and their habitats are shrinking at an alarming rate. Numerous solutions have been implemented to tackle this problem by a number of scientists, activists and organisations thus far. But one particular solution drives me to find better human-wildlife coexistence, that is to encourage effective community-based conservation models.

By making communities aware of the importance of their surrounding landscape and utilising their traditional knowledge to create economic stability through small-scale, community-owned businesses, we can implant a seed of environment conservation. If these local communities are aware, informed and self-sustained, we can truly achieve wildlife/biodiversity conservation through harmonious coexistence.

With this project, we aim to understand the perspective of local communities living in the high altitudes of the Indian Himalayas towards leopards (locally known as Guldaar, Baghera or Bagh) and the impact of this coexistence. Also, by deducing some of the significant factors that influence the interactions between local communities and leopards, we aim to implement mitigation controls, such as, community engagement/ awareness activities, predator-detering techniques, enhancing livestock herding techniques, establishing few small-scale/ community-owned ventures, etc. The progress of the implemented controls will be monitored by community members who will be selected and trained throughout the project.

The joys and perils of wildlife conservation: the case of the leopard and its fans - Dr. Vidya Athreya

Most of us get into this field because we are passionate about animals and wildlife. Human beings don't usually feature in creatures we are fascinated about. Wildlife conservation in India, however, should reformat the way you think of wildlife and of people because that is the only way you will be successful in any conservation work. We cannot avoid people in this densely populated country even in the deepest pristine spaces we have. If not for the tribal, you will meet a forest guard, still a human! And a very crucial and important stakeholder. How does one then, who has come from a place of wanting to work only on animals try and do conservation? I will share some lessons learnt.

Understanding the impediments in implementing community forest rights in a biodiversity hotspot: Western Ghats of Karnataka, India - Roshni Kutty

With its provision to recognise community forest rights (CFRs) over land used by forest-dwelling communities, the Forest Rights Act of 2006 (FRA) has the potential to empower about 200 million forest dwellers with control over approximately 34.6 million hectares of India's forests in around 1,70,000 villages. Scholars and activists have criticised its poor implementation, as only about 3% of its potential has been realised (Kumar et al., 2017), despite a decade since the 2012 rules were passed. While these numbers definitely point to poor implementation

of the law, and while the main reason remains stalling or active opposition by the forest department, I show that other factors may also be at work. My studies in the northern Western Ghats region of Karnataka show how pre-existing institutions of forest management and access, shaped by the history and geography of the region have disincentivized claims on the forest commons. I combine data obtained through archival research and semi-structured interviews with communities and implementing bureaucrats, to establish how different communities have prior but differential and often individualised access to various forest resources. The incentive to apply for collective rights therefore may often not exist due to the forest governance history of a region. I suggest that a more context-sensitive and flexible approach, backed by an understanding of the region's history, is required to fulfil the goals of devolution of rights over common pool resources.

Assessing the status of fireflies and its conservation practices through community participation in Doon Valley, Uttarakhand, Western Himalaya - Nidhi Rana

Fireflies belong to the family Lampyridae, order Coleoptera. They are magnificent beetles possessing the property of bioluminescence. Fireflies are well-known bioindicators of a healthy environment. However, several studies from all over the world have shown a decline in their population. This study aims to evaluate the diversity and abundance of fireflies in four forest ranges: Thano, Badkot, Asharodi, and Malhan of Dehradun forest division. Each range is divided into four different habitat types (forest, urban, agricultural, and riverine area) which are further divided into three sampling plots according to the disturbance gradient (high, medium, and low). Sweep net and handpicking methods were used for sampling of fireflies documentation. Digital photography was also done to record an account of their abundance. There were a total number of 64 sampling plots in all the ranges, 12 plots in each range. Stratified random sampling was done in all the plots. We observed variations in the numbers of fireflies in different ranges. In Asharodi, the number of fireflies was very high, whereas in Badkot it was low. Total three genera of fireflies have been documented. Work has also been done to escalate awareness among stakeholders, like an online survey to estimate fireflies number over the country was conducted on world firefly day (3rd – 4th July, 2021) and we have also presented a presentation on fireflies to the stakeholders.

Status of *Mulleripicus pulverulentus* – the largest woodpecker in Pawalgarh Conservation Reserve - Sarabjeet Kaur Narula

The great slaty woodpecker (*Mulleripicus pulverulentus*) is among the largest woodpeckers in the world with uneven distribution due to deforestation and the loss of old-growth forests. We study the distribution of the woodpecker at Pawalgarh Conservation Reserve and the immediate region outside the protected area over two breeding and post-breeding seasons each. Our study population is among the north-western distribution of the species in the Western Himalayas. The population is represented by 14 groups with a total of 63 individuals occurring in groups of three to seven individuals. Each group was attended by the same individuals on successive observations within their territories. Out of 14 groups, seven were recorded within the conservation reserve boundary and seven from outside the reserve boundary. Dominantly 36 percent was represented by three individuals followed by 28 percent with five individuals, two 14 percent units were represented by four and seven individuals each, and only 7 percent had six individuals. Groups exhibit a considerable range of social behaviours, including nesting (group breeding), searching and exploiting highly profitable food sources. Almost, all the breeding attempts in our study area showed cooperative breeding, however, long term studies are important to address many behavioural questions.

Risk of gastrointestinal parasite transmission from relocated commensal bonnet macaques to wild animals in southern India - Shanthala Kumar

Gastrointestinal parasites get their nourishment from host organisms; thus, they are commonly harmful to their hosts. The host always exhibits a strategy to prevent parasites or overcome the effect of parasites. Conversely, parasites try taking partial control over the host's behaviour, so that the changed behaviour can help in its transmission. Yet, many strategies have co-evolved among hosts and parasites to retain the balance in relationship to avoid a breakdown in the life cycle. If there is a breakdown in the stability of the relationship between the hosts and parasites, the resulting impact may be severe on the population of host species, which may be of concern for their management. Such breakdown also can happen due to human interference like altering the habitat conditions (fragmentation, loss of forests) or directly interfering with the community of host species. Understanding of such interventions on host species and its survival is essential in the conservation and management of wildlife. However the current findings indicate that relocation of commensal bonnet macaque to wild habitats can possible to lead transmission of novel endoparasites to the native animals like endemic lion tailed macaque which can affect their population. Thus, we suggest avoidance of such relocations, however, if inevitable, the captured animals need to be screened and treated for diseases and endoparasites before relocations.

Roost habitat use of harriers in Rajasthan - Ashok Verma

Harriers only group of predatory birds that roost and nest on the ground in rank vegetation. Although they are widespread winter migrants in India, the conservation status specific to all six species wintering in India has not been assessed. Standing at the apex of the food chain, they indicate the health of ecosystems, such as grasslands and wetlands, which they use for their communal roosting and foraging in winter. In the present study, I attempt to collect data on their roost-habitat use and movement patterns: from being solitary during the day when they forage to becoming communal in the evenings while roosting. Various types of habitats were identified in Rajasthan for five harrier species i.e. Eurasian marsh, hen, Montagu's, pallid and pied harriers. These resources are important for their survival as they arrive here from as far as 40 km for roosting, confirmed by radio-telemetry data. This study has highlighted major threats associated with roosting habitats and discussed their conservation measures.

If you built it, they will come: urban green spaces as a tool for conserving urban avifauna - Monica Kaushik

Urban green spaces are established to reduce the negative impacts of urbanisation by conserving a large suite of species. Yet our knowledge on the significance of urban green spaces for supporting urban fauna and enhancing species richness is lacking for tropical countries such as India. We undertook this study to investigate the role of landscape and local-scale features in shaping the bird community within urban green spaces during the breeding and non-breeding season in Dehradun, India. We quantified landscape-level variables in the 250 m buffer around 18 urban green spaces. We sampled vegetation and bird communities during the breeding and non-breeding season through 52 intensive sampling points spread across 18 urban green spaces. Size of the urban green space at landscape-level and tree species richness at the local scale emerged as important predictors influencing bird species richness, density and richness of imperilled insectivorous guild across seasons. Urban green spaces within education institutions and offices that experience less vegetation management supported higher bird species richness and density whereas city parks were species poor. Community composition was affected more

strongly by built-up cover and barren area in the landscape matrix and also by tree species richness at the local scale within urban green spaces. City planners should focus on allocating green spaces within urban settings and expanding the formal green spaces. Existing green spaces could be improved by augmenting compositional and structural heterogeneity of vegetation as well as conservation of large old native trees.

Assessing the trends of human elephant conflict in Keonjhar forest division, India, using spatial-temporal analysis - Bismay Ranjan Tripathy

The escalation of human-elephant conflict influences local communities and threatens the survival of Asian elephants in India. Furthermore, information gaps hamper efforts of conflict management. This study deals with the spatial aspects of human-elephant conflict in the Keonjhar forest division of Odisha, where 345 people were killed and 5,145 hectares of croplands were destroyed by elephants between 2001 and 2018.

The objectives of this study were to assess the temporal trends and seasonal variation in conflict, derive spatial patterns of conflict incidences, map the temporal change in the spatial risk of conflict, and evaluate the number of people vulnerable to human-elephant conflict in the hotspot zones using spatial-scan statistics.

We found that the intensity of human death and injury and house damage had declined over the 18 year period. Crop damage was the most frequent form of conflict that severely intensified post-2009. The winter season had a significantly higher risk of conflict occurrence and the spatial distribution of conflict was found to be clustered around the north-east and central regions of the study area that became hotspots after 2007. People exposed to conflict escalated from 14,700 individuals during 2001-2006 and 34,300 people in 2007-2012, to 65,500 people during 2013-2018.

Bhopal's urban tigers: understanding tigers and their interactions with humans in Bhopal, Madhya Pradesh, India - Durga Prasad Srivastava

With increased tiger numbers and dispersal, about 40 percent of all tigers in India live outside the protected area network in human-dominated lands (NTCA, 2020) i.e. typical mosaics of multiple-use forests and agricultural fields that surround villages, towns, and even cities.

Currently in India, rapid, and often poorly planned economic and infrastructure development is resulting in a rapid transformation of settlements and areas surrounding these. The natural landscapes in the proximity of these rapidly transforming human habitations are over-used, fragmented and disturbed (McKinney, 2002).

Bhopal is a historic city and the capital of Madhya Pradesh State of India. Once a small city, Bhopal expanded rapidly to 2 million (Census of India, 2011) in the last 25 years. Today, the city limits stretch onto and around the Vindhyan hill ranges and forests that were once distant from the human population of the city. Earlier assumed to be occasional encounters during dispersion, our study shows that tigers are now evidently resident in the green-spaces in and around the city of Bhopal without causing any direct conflict with humans. The stealthy and successful breeding tiger population in the midst of a bustling city raises questions about how tigers survive in this urban landscape, and how local people cope with the presence of these big cats. Our study covers the biological aspect of tiger survival and social aspect of people co-existing with tigers and vice-versa.

Examining nature-viewing preferences of tourists visiting three popular Indian protected areas - Dincy Mariyam

Nature-based tourism is rising in popularity in developing countries. This poses a unique challenge for protected areas forcing them to revisit management strategies to balance revenue generation through tourism while maintaining ecological integrity. Identifying tourists' preference for nature-viewing can help develop a holistic management strategy for tourism while also enhancing tourists' experiences. Through our study, we conducted semi-structured surveys with 516 tourists visiting three popular parks in India namely Bandipur, Kanha, and Sunderban National Parks to understand their nature-viewing preferences and their drivers for seven biodiversity groups. We found that tigers were the top viewing preference across the parks followed by other large mammals and landscape, and birds. Tourists' least preferred to view plants and trees, and herpetofauna. Tourists visiting Kanha had a higher inclination towards viewing tigers compared to those visiting Bandipur and Sunderban. Our study shows the significant influence of willingness to visit the park in the absence of charismatic species on viewing preferences for other large mammals, landscape, small and medium-sized mammals, and plants and trees. We found no factors to influence viewing preference for birds. We also found that younger tourists who have supported conservation viewed lesser-known species such as herpetofauna better. Our findings suggest the necessity to create awareness among tourists that moves beyond charismatic species, aiding better travel experiences and sustaining economic benefits for tourism stakeholders. Providing opportunities to develop tourists' interest in lesser-known species through conservation opportunities can help diversify nature-viewing experiences and increase tourism potential in lesser-visited parks.

Post-outreach feedback response: excerpts from 'pollinator photography contest' in and around Kedarnath Wildlife Sanctuary in Uttarakhand Himalaya - Joyeeta Singh

Local community participation is one of the key conservation measures adopted in several threatened biodiverse regions. High-altitude ecosystems in the western Himalayas are fragmented, degraded and threatened with consistently increasing anthropogenic pressure. While studying pollinators' abundance and interaction ecology in Kedarnath Wildlife Sanctuary in the western IHR, we also conducted outreach programs in villages adjacent to the sanctuary. Local communities were made aware of local pollinator insect diversity, ecological importance, threats and concerns, conservation measures and relation with various livelihood options. Most importantly, we announced six months spanning 'pollinator photography contest' as a means of examining the feedback of the local participants and testing their enthusiasm for probable involvement in future pollinator conservation activities. The contestants' responses were analysed to investigate qualitative and quantitative nature and pattern (especially the frequency, duration and spatial extent of response). Types of pollinator insects and the habitats mostly photographed were particularly noted. Association between the response variables and respondent's sociodemographic features (e.g., gender, age, education, socio-economy, socio culture, etc.) were tested. The findings are useful in identifying future pollinator ambassador groups and recommending appropriate strategies for pollinator conservation in the region.

Conservation through Sounds: Using acoustics to evaluate the effectiveness of forest restoration - Vijay Ramesh

In the tropics, regions of tremendous biodiversity also support significant human populations, and increasingly, ecologists are using bioacoustics to monitor wildlife in these landscapes. Using this novel and cost-effective tool, we aimed to study the impacts of rainforest restoration on vocalising biodiversity. For the past two decades, degraded rainforest fragments in the Western

Ghats biodiversity hotspot have been ecologically restored in a landscape dominated by tea and coffee plantations. We assessed whether active restoration resulted in a higher bird species richness and acoustic space use compared to natural regeneration using undisturbed rainforest sites as benchmarks. Acoustic recorders were programmed to collect data for 24 hours for 7 to 15 days at each site. Analysis of 4,196 minutes of dawn chorus revealed an overall species richness of 105 bird species. Rainforest bird species richness was highest in benchmark sites, intermediate in active restoration, and lowest in natural regeneration. However, open-country bird species richness was least in benchmark sites, intermediate in active restoration, and highest in natural regeneration. Analysis of 6,336 hours of acoustic data across all sites showed that benchmark sites harboured the highest acoustic space use (proportion of frequency space occupied per unit time) followed by active restoration sites and natural regeneration sites. In the past, few studies have used passive acoustic monitoring to examine whether active restoration fosters better recovery of rainforest bird species than natural regeneration does. In tropical regions where traditional methods of surveying biodiversity may be difficult, acoustic monitoring can help assess the avian response to ecological restoration.

How animals do what they do? Role of learning in biocontrol. - Deyatima Ghosh

Crop pest regulation is a global challenge and is particularly pertinent as agricultural land use is expanding. A 40 percent loss in global crops due to insect pests is reported by the United Nations Food and Agriculture Organisation (FAO) with the expected loss of attainable yields being 65 to 80 percent. This has an estimated economic loss of more than \$470 billion per year. This crisis comes at a time when our understanding of the effect of agrochemicals on ecosystems, human health, crop quality, crop health, and ecosystem health has resulted in a need to use alternative approaches to manage crop pests. This alternative is biological pest regulation. The economy attached to this service provisioning is \$400 billion per year.

Most studies have explored the ecological aspect of pest regulation that includes maintaining the pest population below a damaging threshold. However, such an approach is incomplete. There is a lack in our understanding of the efficiency of pest regulation by natural enemies because it does not take into account crucial factors which determine how predators learn, find and remember food sources — the cognition underlying their service provisioning.

How animals do what they do is a question that cognition scientists have been exploring however it lacks subsequent implication. This study highlights the importance of integrating natural enemy cognition with their ecological functioning to re-examine the outcome from the perspective of biological pest regulation.

Population, ecology and conservation status of Salim Ali's fruit bat (*Latidens salimalii*) in Munnar landscape - Tijo K Joy

Salim Ali's fruit bat (*Latidens salimalii* Thonglongya, 1972) is the only species in the genus *Latidens* and is considered one of the three rarest bats in the world. Salim Ali's fruit bat is endemic bat, endangered by the IUCN (Molur and Vanitharani 2008) to South India and the only fruit bat to protected under Schedule one of the Indian Wildlife Protection Act, 1972. The first specimen was collected by Angus Hutton (1948) from the High Wavy Mountains in the Theni district of Western Ghats. *L. salimalii* previously reported only in Tamil Nadu side of Western Ghats. The extent of occurrence of this species is 101-5,000 km², and the area of occupancy is 501-2,000 km² (Molur et al., 2002). A small distribution area reported historically and presently, a decline of habitat and small population size. The High Wavy Mountains remained only a distributional record of *Latidens*. This bat was also recorded in the Kalakkad Mundanthurai Tiger

Reserve, Tamil Nadu, previously reported only in Tamil Nadu. More specifically, Vanitharani et al., (2004) calculate the extent of occurrence as being around 1,100 km² based on the location of roosts, while they calculate the area of occupancy as 10.05 km² based on the estimate by Singaravelan and Marimuthu (2003) of a foraging distance of 0.8 km from the roost. Newly reported rare endemic and endangered *L. salimalii* from Kerala (Joy et al., 2018). This report is the first report from Kerala and provides information on the population, ecology, foraging habits and conservation studies of Salim Ali's fruit bat.

Understanding human-elephant interaction at a landscape mosaic in Assam, India - Sayan Banerjee

The present study is situated at Udalguri district of Assam where I am studying how humans and wild elephants interact in a forest-agriculture-plantation landscape. The work is ongoing and I am documenting the spatio-temporal patterns of negative interactions, space and resource usage by elephants as well as humans, livelihood patterns of humans which could potentially overlap with elephants' requirements, elephant behaviour at different spaces and towards humans and human's behaviour towards elephants. I will present the methods employed and the findings till now at the conference.

Assessing the conservation and livelihood impact of Lepidopteran research in the Kameng Protected Area Complex, Arunachal Pradesh, India - Sanjay Sondhi

Kameng Protected Area Complex in Arunachal Pradesh, covers 3,500 sq. km. of closed-canopy forest and ranges in altitude from 100 to 3,500 m including the Eaglenest Wildlife Sanctuary, Pakke Tiger Reserve and Sessa Orchid Wildlife Sanctuary.

Between 2010 and 2015 a Rufford grant funded grant to the author, supported Lepidoptera research as part of an ongoing conservation and livelihood initiative in the Kameng Protected Area Complex. The Lepidopteran Research in the area was continued till 2018 through self funding by the author.

This presentation reviews the impact of the Rufford project on conservation of Lepidoptera in the Kameng Protected Area Complex and livelihood generated for local communities. The author will also review research findings of Lepidoptera in the Kameng Protected Area Complex over the last decade. Finally, an assessment will be made of the short-comings and lessons learnt for applying to future conservation and livelihood programs.

Bird ringing studies and its relevance for conservation – Tuhina Katti

Bird ringing has been critical in establishing the linkage between spatially distant habitats, and in understanding the seasonality and pattern of site use. This study is also helpful in investigating the habitat quality during each migratory stage based on the moult pattern, fat reserve and period of commencing migratory journey. Other applications are calculating the annual recruitment success based on the age data collected and collated from the entire region. Systematic bird ringing started in India in 1959, and since then, with a few gap years, long term studies continue at a few of the sites. Along information on longevity and site-fidelity, geographic populations and life history strategies, the recoveries have provided substantial data. The recoveries were recorded from almost 30 countries across five continents. These have helped mark the boundaries of the three major flyways crossing India and helped shortlist the crucial staging and wintering sites for sites migratory birds which can be prioritised for conservation actions.



Fostering Grass-roots Conservation in India - A Rufford Initiative

The Rufford India Conference, Mumbai, 2021

*Report prepared by Nicole Pinto,
Foundation for Ecological Research Advocacy and
Learning*

*Photo credits:
Nicole Pinto, Rajat Nayak, Sandeep G and Venetia
Sharanya*