

Fostering Grass-roots Conservation in India A Rufford Initiative

*The Rufford India Conference
Udaipur, 2022*

Conservation in Semi-Arid and Arid Landscapes

**Foundation for Ecological Research, Advocacy and Learning
&
The Rufford Foundation**

12th to 15th March 2022

**Bamboo Sea Resort & Spa
Udaipur, India**

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Advocacy and Learning



Fostering Grass-roots Conservation in India – A Rufford Initiative

The Rufford Foundation is an organisation based in the United Kingdom that supports nature conservation projects in various developing countries. Till date, the foundation has funded 1,175 projects in the Indian sub-continent and over 5,600 projects worldwide. The Rufford Foundation also hosts conferences in collaboration with local organisations in various parts of the world to encourage communication and collaboration between grant recipients and researchers.

This year the conference was held in Udaipur in collaboration with the Foundation for Ecological Research, Advocacy and Learning (FERAL) from the 12th to the 15th of March 2022. The theme of this event was “conservation in semi-arid and arid landscapes”. Udaipur is famous for its lakes, palaces, forts, temples, gardens and rich culture. It is surrounded by Aravali mountains and has different forest types ranging from dry deciduous forests to scrubs and thorns that are abode to fauna and flora unique to arid and semi-arid landscapes. This was the seventh conference that had been organised in collaboration with FERAL. Previous conferences have been held in New Delhi, Bengaluru, Rajasthan, Goa, Uttarakhand, the Andaman Islands and Mumbai. Each conference is aimed at providing a forum to discuss ideas and problems and towards creating networking opportunities between grantees.

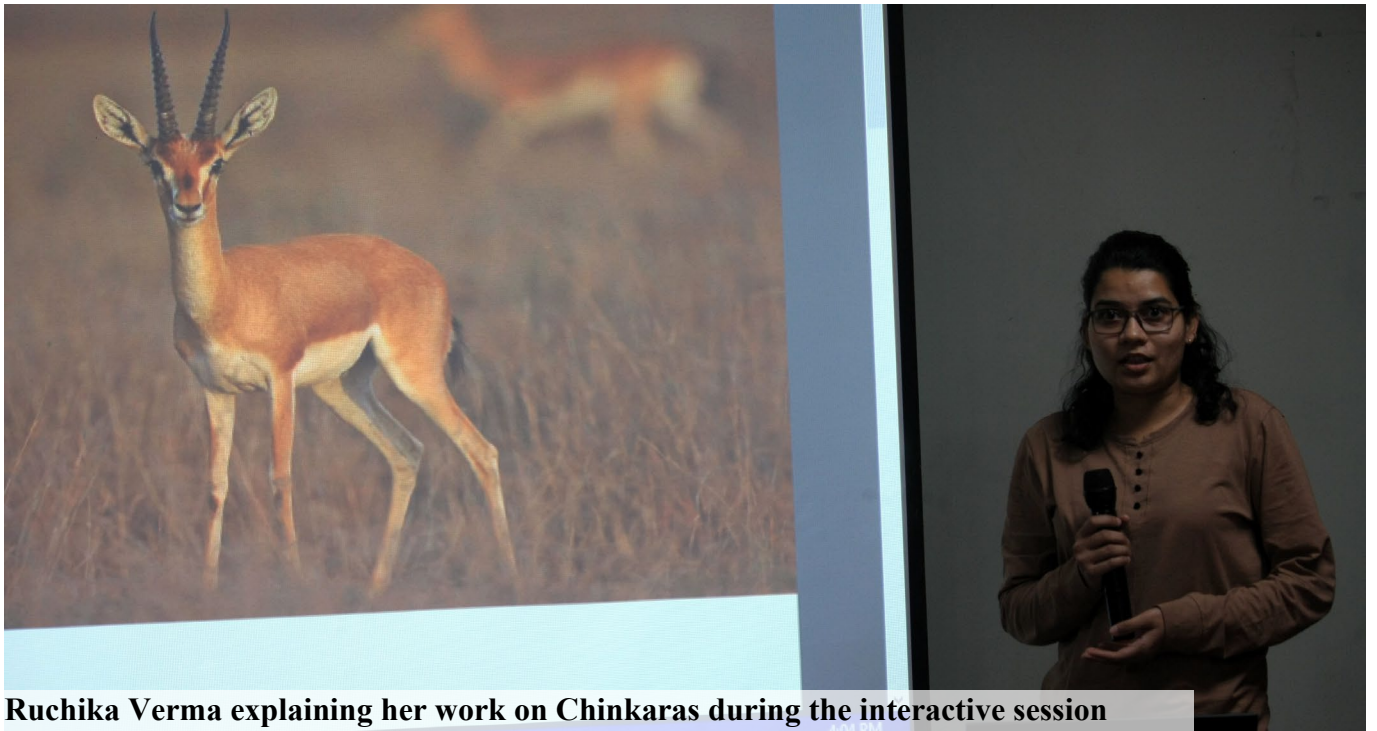
Goal of this conference was to provide a common platform for the Rufford grantees from India to meet at one place and share and learn from each other's' conservation experiences. It also provided an opportunity for the grantees to interact with the conservationists and researchers working in arid and semi-arid parts of Western India. This year, 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 a total of 21 presentations by researchers and four popular talks. Participants presented their work in three different formats: Oral presentations of 18-minute length, speed talks of 8-minute length and presentations of videos.

Day 1

Ms. Sunita Ram (Senior Researcher, FERAL) welcomed all the participants, and explained the aim and objectives of this conference and encouraged participants to interact and form networks. After this, we had an interactive session where participants introduced themselves and their work through photographs of their study landscape and work.



Dhawal Mehta introducing himself during the interactive session



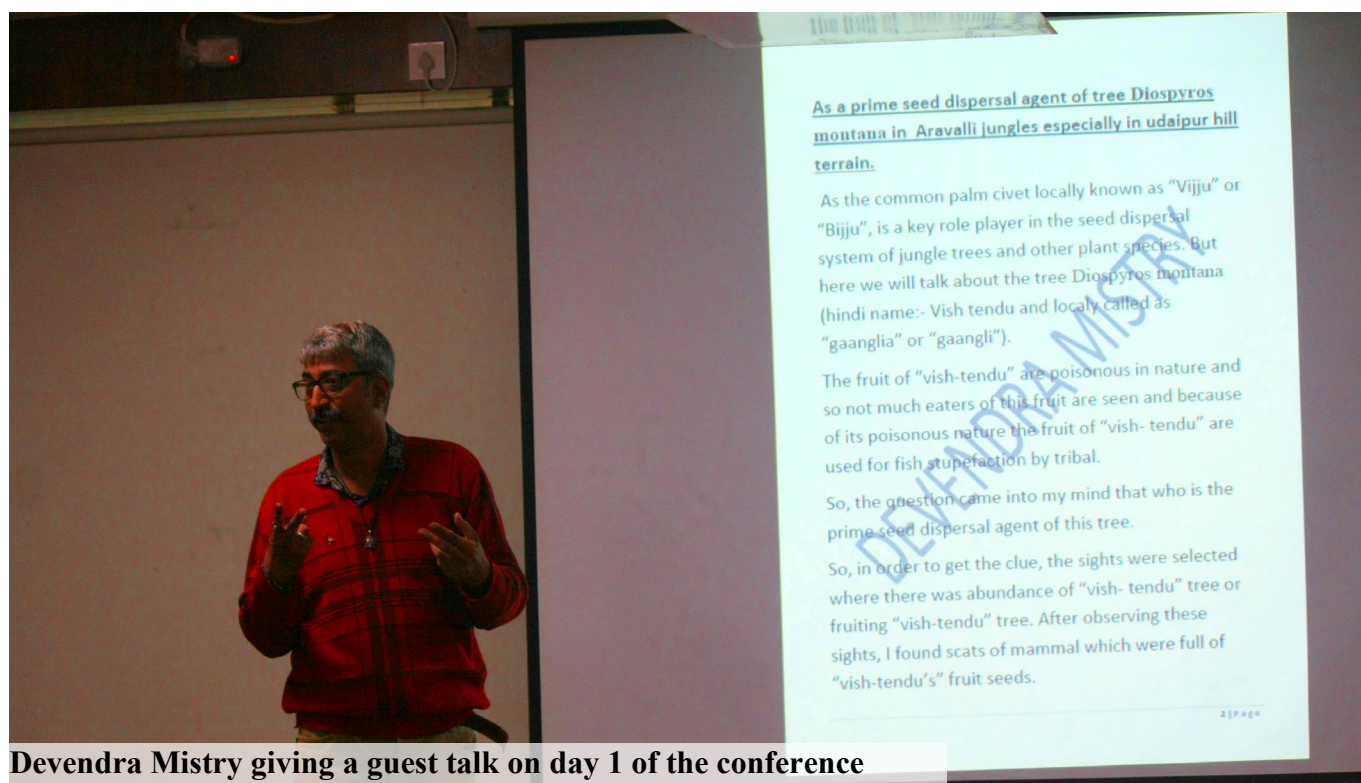
Ruchika Verma explaining her work on Chinkaras during the interactive session

Then **Dr. Sunil Dubey** (Institute for Ecology and Livelihood Action) gave a popular talk on the status of biological resources in Rajasthan and issues related to protection and conservation of these resources. He gave a broad overview of forest types, physiography and biodiversity of Rajasthan, and explained the significance of Aravali mountains in shaping the floral and faunal communities in Rajasthan. He also spoke about endemic plants, plants of medicinal value, ethnobotany, and status of threatened plants in Rajasthan. He also emphasized the need to study indicator species of different ecosystems, and the importance and threats to sacred forests (orans) in Rajasthan. He concluded his talk with examples of establishment of community managed forests and finding solutions to invasive plants through planting of indigenous plants.



The next presentation was by **Mrunal Ghosalkar**, who showed a video describing her work in human dominated parts of Maharashtra. Her work mainly involved increasing awareness among local people about the leopard and its behaviour, and better equip local people in reducing the conflict through adopting simple safety measures. The video showed various outreach and educational campaigns and workshops conducted by the researcher during her work.

In the evening we had a talk by **Devendra Mistry** (Naturalist), on field observations related to seed dispersal by palm civet and its role in structuring vegetation, and mimicry by a grassland bird, Syke's Lark, and how the mimicry can be a proxy for biodiversity in a particular landscape.



Devendra Mistry giving a guest talk on day 1 of the conference

Day 2

The second day began with a guest talk by **Dr. James V Haokip**, Sikkim University. Dr. Haokip spoke about the community managed Fish Conservation Zone (FCZ) that has been established in Khengjang-Yangoulen villages of Manipur. He explained the challenges faced in establishment of FCZ, existing threats, and opportunities. His talk gave an overview of challenges of working in Northeast India, which is tribal dominated. People often are ignorant of the need for conservation and preservation in these landscapes. However, the establishment of FCZ suggested that with some dedication and raising awareness among local communities' conservation of biodiversity and natural resources is possible in these landscapes.

After this talk, researchers presented their work. 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.



Dr. James Haokip giving a guest talk Community Managed Fish Conservation Zone

Dhawal Mehta presented his work on four-horned antelope (Chousingha) in Gir National Park. Chousingha is Asia's smallest antelope and is endemic to the Indian Sub-Continent. IUCN has listed this species as Vulnerable. Dhawal Mehta studied the distribution and abundance of this antelope, and factors that determine its distribution. He also studied imminent threats to this species in Gir landscape. He found that Chousingha were present at low densities in the landscape, and their distribution was largely determined by vegetation type, elevation and proximity to water. The study helped in assessing wild prey density in Gir National Park and created awareness about Chousingha among local stakeholders.

Nidhi Rana presented her work on one of the lesser studied species, the fireflies. She studied the diversity of fireflies and the factors that adversely affected its population in Dehradun Forest Division. Her study found a total of three different genus of fireflies. She also found that urbanisation, infrastructure development, and increasing use of streetlights along with deforestation and fragmentation adversely affected firefly population. Her study also involved conducting outreach programs for creating awareness among various stakeholders in Doon Valley. In future, she is planning to extend her survey to the entire state of Uttarakhand, and she also plans to explore Firefly Ecotourism as a conservation option.

Ritesh Kumar Gautam studies diversity, distribution and ecology of wild bees in the Western Himalayas. His study found a close association between bee species diversity and forest type and elevation. The species diversity was the highest in Moist temperate mixed deciduous forest of mid

elevational zones (1800m–2800m), whereas High elevation Alpine meadows (above 3600m) and pine forests of lower elevation (below 1800m) had low species diversity. He has been sharing his findings to the forest department, native people and tourists in order to create awareness on the role of bees in sustaining natural forests, agriculture and urban forests.

Kalavanti Mokaria, an entomologist from Gujarat, explained about the community composition of dragonflies and damselflies in Nalsarovar Bird Sanctuary. Dragonflies and damselflies are indicator species of the health of a wetland. During her survey, she found a total of 30 species of adult dragonflies and damselflies belonging to 5 families. Her study provides a benchmark for monitoring of dragonflies and damselflies in the state of Gujarat and similar wetlands in the country.



Rajendra Choudhary, a forest guard and researcher, presented his observations on dispersal of Mugger Crocodiles and the effect of hydroelectric dams on their migration. He observed that due to sudden release of water from dams during monsoon, crocodiles were forced to move away from the dam into the human dominated areas to avoid high water pressure. This has increased human-crocodile encounters and crocodiles were rescued in greater numbers from nearby towns and villages from August to November months and released into catchment area. He is planning to conduct radiotelemetry of rescued and released crocodiles to understand their migration patterns and nesting behaviour.

Mahi Puri presented her work on carnivore conservation virtually. She used spatial conservation planning tool, Marxan, to identify areas in private lands for agro-forestry around Pench Tiger Reserve.

These agroforestry areas could provide habitat for carnivores outside protected areas and could aid in conservation of these threatened species in the landscape.

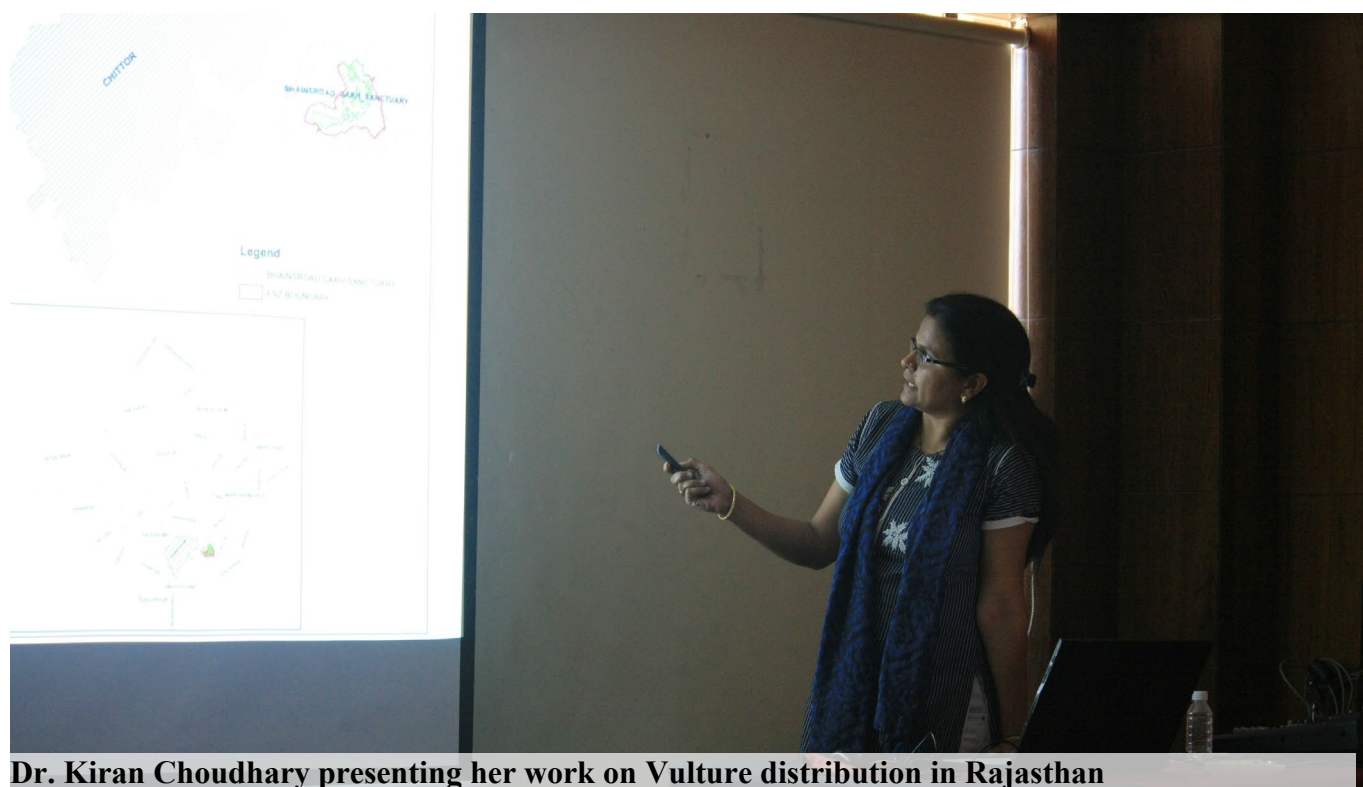
Tapan Adhikari presented his work virtually. He studies the distribution of Great Indian Bustard (GIB), present and past distributions, and threats to the species using questionnaire and field surveys. His study found that 3.46% of area were being used by GIB in the Thar Desert Landscape. Despite government's efforts, GIB is still facing greater threats in the form of habitat loss due to encroachment, collision with high-tension power lines, feral dog attacks, and collision with vehicles.

Ruchika Verma, studies behaviour and seasonal habitat use by Chinkara in Thar Desert of Rajasthan. She found that Chinkara prefers grasslands over scrubland, vegetated sand dunes and agricultural lands. Chinkara were more vigilant in sand dunes during monsoon while they were more vigilant in agriculture lands in winter seasons.

Rishikesh Tripathi has studied spider assemblage in enclosures created for the conservation of Great Indian Bustards (GIB). He found 120 species of spiders within GIB enclosures. He had discovered 14 new species in the landscape. This study suggests that flagship species-centric conservation approaches could help in conservation of other species of fauna in the landscape.



Rishikesh Tripathi giving a talk on spider assemblages in Thar Desert



Ashish Kumar Jangid has identified potential suitable sites for Asiatic Caracals using Ensemble models. He found a significant positive relationship between vegetation height and habitat suitability for caracal. He has identified around 567 km² area in Gujarat, Rajasthan and Madhya Pradesh that could be a potential habitat for Caracals in India.

Kiran Choudhary described her work on Oriental White Backed Vultures in Rajasthan. She has identified feeding and nesting sites of these vultures in Rawatbhata region in Rajasthan and plans to continue monitoring of vultures and conducting awareness and education programs in schools.

Vishal Thakur spoke about human-wildlife relationships in Gujarat. He has noticed an increase in human-leopard conflict in the region over the years. The key reasons for this increased conflict are increase in leopard population in forested areas and corridor disturbances due to large scale development projects.

The last two presentations of the day were Video presentations. **Tarsh Thekaekara** presented a video which shows perception of the Forest Department about the invasive alien plant species, *Lantana Camara*. **Gaurav Dixit** presented a video that outlines human-wildlife conflict in Uttarakhand and the perception of local people towards wildlife.

In the evening the participants visited Sajjangarh Fort and Sanjjangarh Wildlife Sanctuary. Dr. Sunil Dubey accompanied us during this field visit, and he explained about the establishment of Wildlife sanctuary, different forest types in the region and associated fauna.



Participants at the Sajjangarh Fort



Dry Deciduous Habitat at Sajjangarh Wildlife Sanctuary

Day 3

On the third day of the conference participants visited Kumbhalgarh Fort and Kumbhalgarh Wildlife Sanctuaries. Kumbhalgarh Fort is also known as the Great Wall of India is the second longest wall of the world after the Great Wall of China. It is built along the Aravali mountains and is located 85 km north of Udaipur. Dr. Sunil Dubey showed and explained about various geological rock formations and different pioneer plant species in the fortress area. He also explained unique rainwater harvesting and filtering methods that were adopted by people in these drier areas.

From the fort we visited Kumbhalgarh Wildlife Sanctuary. Kumbhalgarh Wildlife Sanctuary represents northern Aravali vegetation type. Recently, it has been recognised as a potential site for Tiger Reintroduction in Rajasthan. Range officer, Mr. Kishore Singh interacted with participants and told them about the sanctuary, its importance, biodiversity and threats. During the Safari participants learned about different vegetation types, wild prey base for tigers in the sanctuary, and potential for an expansion of the sanctuary.



Participants at the Kumbhalgarh Fort



Dr. Sunil Dubey interacting with the participants at Kumbhalgarh Fort



Participants at the Kumbhalgarh Fort



The Aravali Mountain range that is part of the Kumbhalgarh Wildlife Sanctuary



A herd of Sambar Deer seen during the Safari in Kumbhalgarh Wildlife Sanctuary

Day 4

On the last day of the conference, we had five presentations by the participants and one guest talk by Dr. Sutirtha Dutta from Wildlife Institute of India. **Krishnedra Singh Nama** spoke about human-sloth bear conflict in Southeast Rajasthan. The sloth bear attack incidences on humans have been increasing outside forested areas in Rajasthan. The only way to reduce these incidences is restricting human entry into sloth bear areas and creating awareness among people about sloth bear habitats. He is planning to map all sloth bear presence areas which could help in reducing conflicts in Rajasthan

Urvashi Sharma presented her work on mapping distribution of wolves in Hadauti region of Rajasthan. Wolves have been persecuted largely during British period and post-independence in India. Wolves are now present as small populations scattered throughout arid and semi-arid landscapes of India and Rajasthan. Through field work and questionnaire surveys she identified hotspots of wolf occurrence.

Venetia Sharanya shared her experience on working in areas where humans and elephants share space and resources and changing the dominant narrative of "your elephant in my village" to "my elephant in my village" by adopting village-level farming and lifestyle practices that are compatible with elephant use of the landscape.

Kumaran K is studying the distribution of Invasive Alien Species in the high-altitude grasslands of Nilgiris in South India. He has found an increase in the extent of invasive plants in the region along with an increase in built-up areas and agriculture. This change in land-use and land-cover is likely to affect ecosystem processes and services in the region which needs to be studied in the landscape.

Mehul Singh Tomar works on Vulnerable Indian soft-shell turtle in Haryana. His work suggests that community managed pond could be an important refuge for several of threatened species and could help in conservation of these species.



The final talk of the day was delivered by **Dr. Sutirtha Dutta** (Researcher, Wildlife Institute of India). He spoke about his work on conservation of Great Indian Bustard (GIB) over the past 15 years in Rajasthan. GIB is a critically endangered species, with its numbers declining rapidly over the years. Habitat loss due to unplanned agricultural, industrial & infrastructural developments, over grazing by livestock, and human induced mortalities are some of the major threats to this species. The species also shows low recruitment rate. He spoke about the Bustard Recovery Plans that have been initiated by Government of India and Wildlife Institute of India. As part of this program conservation breeding programs have been initiated which aims at developing captive populations that can be released into the wild. There have been efforts under the program to reduce threats in their natural habitats based on rigorous scientific data. Habitat restoration is important for the longer-term survival and persistence of this species and efforts are being made in securing 500 km² habitat of this species in Rajasthan.



Dr. Sutirtha Dutta explaining about the life history and threats to Great Indian Bustard



Dr. Sutirtha Dutta having a discussion with the participants

Issues raised and recommendations made by participants

Since 2012, Rufford conferences are being organised in India regularly. It has been noted that there have been very few researchers who have received a Rufford Grant since 2018. Most of the grantees have already attended and presented their work at different conferences. Hence, it was felt that in future a few workshops aiming at skill development of grantees should be organised in India.

Appendix 1. List of Participants

Sl. No	Name	Email address	Organization	Mode of Participation
1	Dhawal Mehta	dhawalbmehta@hotmail.com	Independent Researcher	In-person
2	Gaurav Dixit	gaurav.dixit.a1@gmail.com	Czech University of Life Science	Virtual
3	Kalavanti Mokaria	kalavantimokaria_a04@gmail.com	The Mahatma Jyoti Rao Phoole University, Jaipur, Rajasthan	In-person
4	Kiran Choudhary	choudharykiran01@gmail.com	Lzebra P.G. College, Kota, Rajasthan	In-person
5	Krishnendra Singh Nama	namasahib@gmail.com	Society for Conservation of Historical & Ecological Resources	In-person
6	Kumaran K	kumaran.k.b@gmail.com	ANCF	In-person
7	Mehul Singh Tomar	mstnilssonia@gmail.com	Guru Ghasidas University	In-person
8	Nidhi Rana	kuku.nidhi66@gmail.com	Wildlife Institute of India	In-person
9	Rajendra Chaudhary	kukaa434@gmail.com	Rajasthan Forest Department	In-person
10	Rishikesh Tripathi	rishikeshtripathi14@gmail.com	Christ college	In-person
11	Ritesh Kumar Gautam	gautam.ritesh878@gmail.com	Wildlife Institute of India, Dehradun Uttarakhand	In-person
12	Ruchika Verma	ruchikaverma754@gmail.com	Wildlife Institute of India, Dehradun	In-person
13	Urvashi Sharma	urvashiwildlife@gmail.com	Chambal Rescue Force	In-person
14	Venetia Sharanya	venetia@feralinda.org	Foundation for Ecological Research, Advocacy and Learning	In-person

15	Sunil Dubey	dubeys1230@gmail.com	Institute for Ecology and Livelihood Action	In-person
16	Rajat Ramakant Nayak	rajat@feralindia.org	Foundation for Ecological Research, Advocacy and Learning	In-person
17	Sunita Ram	sunitaram@feralindia.org	Foundation for Ecological Research, Advocacy and Learning	In-person
18	James V Haokip	jvhaokip@cus.ac.in	Sikkim University	In-person
19	Sutirtha Dutta	sutirtha@wii.gov.in	Wildlife Institute of India	In-person
20	Vishal Thakur	vish_vipper@yahoo.co.in	Independent Researcher	In-person
21	Devendra Mistry		Independent Researcher	In-person
22	Banwari Yaduvanshi		Independent Researcher	In-person
23	Ashish Kumar Jangid	ashishjangid22@gmail.com	Wildlife Institute of India	Virtual
24	Mahi Puri	mahi.puri@gmail.com	University of Georgia	Virtual
25	Mrunal Ghosalkar	mrunal8ghosalkar@gmail.com	Wildlife Conservation Society India	Virtual
26	Tapan Adhikari	tapanedu@gmail.com	Jai Narain Vyas University	Virtual
27	Tarsh Thekaekara	tarsh@theshola.org	The Shola Trust	Virtual

Appendix 2. Schedule

12 March 2022

SESSION	TIME	EVENT
Post-lunch session	13.00 – 15.00	CHECK IN, REGISTRATION and LUNCH
	15.10 – 15.15	WELCOME ADDRESS Sunita Ram Senior Scientist Foundation for Ecological Research, Advocacy and Learning
	15.15 – 16.00	INTERACTIVE SESSION
	16.00 – 16.45	POPULAR TALK State of biological resources in Rajasthan and related Issues Dr. Sunil Dubey Managing Trustee Institute for Ecology and Livelihood Action
	16.45 – 17.10	HIGH-TEA
	17.10 – 17.30	VIDEO PRESENTATION Janata Waghoba - the story of people and spotted feline Mrunal Ghosalkar
	17.30 – 18.30	GUEST TALK Devendra Mistry
	20.00 – 22.00	DINNER

13 March 2022

Morning session	08.30 – 09.00	REGISTRATION
	09.00 – 09.30	GUEST TALK Establishing community managed Fish Conservation Zone (FCZ) in Manipur: Challenges and prospects Dr. James V Haokip Assistant Professor Sikkim University
	09.30 – 10.30	ORAL PRESENTATIONS (15 + 3 minute) Dhawal Mehta <i>Ecology and conservation of Asia's smallest antelope in the land of the lions.</i> Nidhi Rana <i>Impact of urbanization on fireflies' population in Doon valley, Uttarakhand.</i> Ritesh Kumar <i>Diversity, distribution and ecology of wild bee (Hymenoptera: Apoidea) communities along the elevational gradient in Western Himalaya, Uttarakhand.</i> Gautam
	10.30 – 11.00	TEA BREAK
	11.00 – 12.45	Kalavanti Mokaria <i>Evaluation of community composition of dragonflies and damsel-flies (Order: Odonata) in Nalsarovar Bird</i>

Pre-lunch session			Sanctuary, Gujarat, India.
	Rajendra Chaudhary		<i>Study on the dispersal of Mugger crocodile (Crocodylus palustris) and impact of a hydroelectric power plant and gravity masonry dam on their migration at Ranapratap Sagar Dam on river Chambal, Rawatbhata, Chhittorgarh, Rajasthan.</i>
	Mahi Puri		<i>An integrated approach to prioritize opportunities for carnivore conservation in shared landscapes. (Virtual Presentation).</i>
	Tapan Adhikari		<i>Distribution of Great Indian Bustard with the causes of existential crisis in the Thar Landscape of Rajasthan, India. (Virtual Presentation).</i>
Post-lunch Session	12.45 – 14.00	LUNCH	
	14.00 – 14.30	SPEED TALKS (5 + 3 minute)	
	Ruchika Verma		<i>Seasonal habitat uses and behavioral time allocation of Chinkara in Thar Desert.</i>
	Rishikesh Tripathi		<i>Assessment of spider assemblages, and their responses to grazing regulation in the Great Indian Bustard habitat of Thar Desert, Rajasthan.</i>
	Ashish Kumar Jangid		<i>An ensemble modelling approach to evaluate suitable habitats for Caracals in India. (Virtual Presentation).</i>
	14.40 – 15.10	ORAL PRESENTATIONS (15 + 3 minute)	
	Kiran Choudhary		<i>GIS based studies on population status of Oriental White Backed Vulture and their conservation strategies in Rawatbhata (Rajasthan).</i>
Evening Session	P Kanak		<i>Human wildlife relationship in Gujarat.</i>
	15.10 – 15.40	TEA BREAK	
	15.40 – 16.20	VIDEO PRESENTATIONS	
	Tarsh Thekaekara		<i>A community-based approach to monitoring and managing Lan- tana camara.</i>
	Gaurav Dixit		<i>Assessing perception of the local community towards leopards in order to construct effective community-based conservation model.</i>
	16.50 – 20.00	VISIT TO SAJJANGARH FORT	
	20.00 – 22.00	DINNER	
14 March 2022			
Morning Session	06.00 – 20.00	FIELD TRIP	City Palace and Kumbhalgarh Wildlife Sanctuary
	20.00 – 22.00	DINNER	

09.00 – 10.00	ORAL PRESENTATIONS (15 + 3 minute)
	Krishnendra Singh Nama <i>Evaluation of Habitat and Human-Sloth Bear Conflict in S-E Rajasthan and its solution.</i>
	Urvashi Sharma <i>Population status & Habitat Ecology of Indian Grey Wolf (Canis lupus pallipes Sykes, 1831) in Hadauti region, Rajasthan.</i>
	Venetia Sharanya <i>From your elephant in my village to my elephant in my village: Changing narratives of conflict by empowering local communities with site-specific strategies.</i>
10.00 – 10.30	SPEED TALKS (5 + 3 minute)
	Kumaran K <i>The Distribution of Alien Invasive Species in the high-altitude Shola Grassland habitats of Nilgiris district in Tamil Nadu.</i>
	Mehul Singh Tomar <i>Indian Soft-shell Turtle Nilssonina gangetica (Cuvier, 1825) in a community conservation reserve, Fatehabad, Haryana.</i>
10.30 – 11.30	POPULAR TALK
	15 Years with Bustards
	Dr. Sutirtha Dutta Scientist
	Wildlife Institute of India
11.30 – 12.00	TEA BREAK & CHECK – OUT
12.00 – 14.00	CONCLUDING REMARKS & LUNCH

Appendix 3. Abstracts

Janata Waghoba – the story of people and spotted feline

Mrunal Ghosalkar

Major part of western Maharashtra is an irrigated agricultural landscape which supports large carnivores such as leopards living alongside high densities of humans. The livelihood of people in the area are agriculture and livestock rearing. Livestock depredation by leopards is commonly recorded here with very few instances of loss of human life. There is definitely a fear of the leopards in the landscape which is also fueled by the extreme negative reporting of leopard incidences in the media. Increased fear also results in undue pressure being put on the managers of the area to take knee jerk actions such as setting up traps even if leopard has been only seen. The aim of this project was to transform this fear into a greater understanding of leopards through imparting knowledge from both scientific and traditional origins on leopard behavior and the precautions people need to take to reduce conflict.

This work was initiated in Niphad (Nashik, Maharashtra) and Junnar (Pune, Maharashtra) which included conducting workshops for the Forest Department, Schools, Colleges and Media on (i) leopard behavior (ii) precautionary measures related to the safety of humans and their livestock (iii) creating children leopard ambassadors who can spread awareness about leopards in their own community.

Our aim was to make people aware of simple safety measures they can use to reduce conflict. Our belief and experience is that a greater understanding leads to a reduced fear and a more rational way of dealing with the issue of shared spaces between large wildlife and people. Our work also provides a platform for the different important stakeholders to have dialogue with each other. It also aims at increasing the knowledge in community.

Ecology and conservation of Asia's smallest antelope in the land of the lions

Dhawal Mehta

The four-horned antelope (*Tetracerus quadricornis*) is endemic to India. Very few studies have addressed the biology and ecology of this species. The current study was carried out in the Gir Protected Area to assess the abundance and understand the factors governing the distribution of the species. An additional aim of the project was to generate awareness among stakeholders for conservation of the species in the landscape. The abundance estimation was carried out using Distance sampling through data collected on vehicle transects. Presence only models were analyzed in a GIS platform to understand the factors that governed the distribution of the species in the study area. The density estimate of the species in the Gir Protected Area was found to be 0.17 ± 0.06 (SE). The distribution of the four horned antelope was assessed using Maxent. Vegetation, Elevation and proximity to water chiefly contributed to the distribution of the species in the landscape. Awareness among locals and the forest staff was generated throughout the duration of the project.

Impact of urbanization on fireflies' population in Doon Valley, Uttarakhand

Nidhi Rana

Urbanization is the toughest challenge that biodiversity is facing over the world and fireflies are one of its victims. Fireflies are known for their magnificent property of bioluminescence; they belong to the family Lampyridae (order- Coleoptera). These beetles can present a good model to evaluate the impact of anthropogenic pressures on nocturnal wildlife. Nevertheless, the taxon is still least evaluated. Therefore, this study aims to assess the diversity of fireflies in four forest ranges (Thano, Badkot, Asharodi, and

Malhan) of the Dehradun Forest Division and to highlight the factors which are adversely affecting the population in the areas. Each range was 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 fireflies' documentation. Digital photography was also done to record an account of their abundance. There were a total number of 48 sampling plots in all the ranges, 12 plots in each range. Stratified random sampling was done in all the sampling plots. Variation in the number of fireflies was observed in different ranges. Deforestation, streetlights, habitat fragmentation came out to be the main reason behind this variation. A total of three genera of fireflies were documented from the sampling areas. An online survey to estimate fireflies' number over the country was conducted on World firefly day (3rd – 4th July 2021). Interviews with local newspaper and workshops for stakeholders was also conducted.

Diversity, distribution and ecology of wild bee (Hymenoptera: Apoidea) communities along the elevational gradient in Western Himalaya, Uttarakhand.

Ritesh Kumar Gautam

The Himalayan ecosystem is remarkably rich in biodiversity and endemism, but also fragile and facing threats due to forest fragmentation, overexploitation, and climate change. Being part of the ecosystem, Himalayan wild bees are impacted by these menaces. Nevertheless, the diversity and ecology of Himalayan wild bees are not well documented. Our study is being conducted along the elevational gradient of Kedarnath Wildlife Sanctuary and it aims to: (1) elucidate diversity and distribution of wild bees and association in their occupancy and different plant communities; (2) reveal their pollination inactions; (3) partake in their conservation through spreading awareness about their significance. We are developing forest type-wise bee inventory using sweep net and coloured pan traps on different elevations. For documenting the pollination interactions, along with ocular observations, we also used CHDK enabled Canon PowerShot cameras on tripods, as flower pointed camera traps. We found association of the bee species diversity with forest types and the elevations. The species diversity is highest in Moist temperate mixed deciduous forest of mid elevational zones (1800m–2800m), whereas Alpine meadows of extremely high elevation zones (above 3600m) and gregarious pine forests of lower elevation zones (below 1800m) represent low species diversity. This coalition results in pollination interdependency between bees and the plants: the high elevation plants (*Bistorta*, *Potentilla*, *Taraxacum*) are majorly (perhaps only) pollinated by bumblebees. We are disseminating our findings to the forest department, native people and tourists to explain bees' role in sustaining natural forests, agriculture and urban forests.

Evaluation of community composition of dragonflies and damselflies (Order: Odonata) in Nalsarovar Bird Sanctuary, Gujarat, India

Kalavanti Mokaria

A study was carried out in Nalsarovar Bird Sanctuary to evaluate community composition of Odonates (Dragonflies and Damselflies) in Nalsarovar Bird Sanctuary (Ramsar Site), Gujarat. Belt transects survey was carried out at Nalsarovar Bird Sanctuary covering all habitats. Each transect was repeatedly surveyed in all seasons. A total of 30 species of adult dragonflies and damselflies were encountered belonging to 5 families namely Libellulidae, Gomphidae, Aeshnidae, Coenagrionidae, and Lestidae during the entire study. During the study, percentage frequency of occurrence, abundance and density of Odonates were calculated based on data collected to evaluate community composition of Dragonflies and Damselflies in Nalsarovar Bird Sanctuary. During the entire survey, the percentage frequency of occurrence of 3 species namely *Brachythemis contaminata*, *Pantala flavescens* and *Trithemis pallidinervis* were recorded highest. The most abundant species encountered were *Pantala flavescens* followed by *Trithemis pallidinervis*, *Brachythemis contaminata*, *Ischnura aurora* and *Ischnura senegalensis* respectively among all species

encountered during the survey. However, the density of Odonates species namely *Trithemis pallidinervis* were highest which was further followed by *Pantala flavescens* and *Brachythemis contaminata*, *Ischnura senegalensis* and *Ischnura aurora* respectively during the entire survey. This study can be used as a benchmark for future conservation and monitoring of Odonates in state as well as for wetland with similar habitat and environmental condition worldwide.

Distribution of Great Indian Bustard with the causes of existential crisis in the Thar Landscape of Rajasthan, India

Tapan Adhikari

Great Indian Bustard (GIB) is an endemic species to holds a sustainable breeding population across isolated pockets of the Jaisalmer district, Rajasthan of India. This study aims to bring the threats, historical and current population distribution of GIB into the limelight using questionnaires and transect analysis. The questionnaire statements were framed, and responses were recorded on 4 points agree-disagree scale. The 31,440.77 sq. km study area was divided into IGNP block having 112 (14,694 km²), DNP block having 67 (9,637 km²) and Pokaran block having 52 (7108.49 km²) grids. The socio-economic structure was recorded from two participants chosen randomly in each of 135 villages. It was also recorded that GIB was still struggling for its survival despite effort from the government and was having a much larger distribution range in the study area. Major threats like encroachment, high tension powerlines, feral dog attacks, wildlife-vehicle collision and overgrazing were recorded and respectively 22.2%, 14.8%, 20.4%, 26.3%, 71.5% responders agree on it. About 7,06,825.97-hectare agricultural land-use of the study area was digitized along with the major canal length of IGNP (257.57 km). Similarly, 928.18 km of the major powerline network and 3908 km of Primary Road network were also digitized. Electrocution of six GIBs alongside road mortality of vertebrates and the episodes of dog attacks on GIB were also recorded during 2017-2021. This study Intensively describes threats and distribution of GIB which is the need of the hour keeping in mind the dwindling GIB population status.

Seasonal habitat use and behavioral time allocation of Chinkara in Thar Desert

Ruchika Verma

Land-use change is a major driving force of habitat modification and has important implications for the distribution of wildlife and maintenance of ecological processes. It can also disrupt behavioral patterns of wild animals to avoid human-activities (Olson et al. 1998, Frid and Dill 2002) which may have fitness consequences. Although these impacts on wildlife have received considerable attention in recent years, space and time utilization of the arid adapted Chinkara *Gazella bennetti* remain poorly studied, as their habitats are undergoing rapid human-mediated changes. I studied the habitat use using distance sampling and behavioral time allocation using scan and focal sampling of Chinkara in four land-use classes: grassland, flat scrubland, vegetated sand dunes and agriculture in the Thar Desert, Jaisalmer, western India. Preliminary findings show that Chinkara prefers grassland over other land-use classes and their time investment in foraging vs vigilance varies considerably with land-use classes, age-sex class and risk. The findings provide quantitative understanding of factors influencing Chinkara behavior and the role of land-use in shaping their spatial distribution pattern which will aide in habitat management for the species.

Hornbill abundances in the agriculture mosaics of the northern Western Ghats

Pooja Pawar

The agriculture-dominated landscapes in the close proximity of forest areas serve as important biodiversity habitats. Due to absence of formal protected areas and conservation attention in such area's biodiversity remains undocumented. Most of the notified terrestrial protected areas occur on the remote mountain tops and ridges with low human interference. The areas on the foothills and lowlands are often neglected and lack reliable baseline information on occurrence, distribution and abundance of flagship species. To bridge this information gap is critical for extending conservation efforts to the non-protected, low-land areas. The present study assessed population status of hornbill species in the human dominated Tillari catchment area in the Western Ghats. The results suggest Tillari catchment area is a stronghold of two endemic species Malabar Pied Hornbill and Malabar Grey Hornbill. Recognition of such conservation priority sites is crucial of persistence of threatened and endemic biodiversity in human-dominated landscape.

An ensemble modelling approach to evaluate suitable habitats for Caracals in India

Ashish Kumar Jangid

Anthropogenic pressures have pushed Asiatic Caracal (*Caracal smitzi*) towards local extinction in India. It was historically reported from several areas of central and northern India but is now restricted to few pockets of Rajasthan, Gujarat, and Madhya Pradesh. In this study, we tried to identify the potentially suitable habitats of Asiatic caracals in India through the use of modern modelling techniques and strategic ground surveys. Our ensemble predicted a total of 1207.83 km² areas in Kutch (Gujarat), Aravalli mountains and Malwa plateau (Rajasthan), Malwa Plateau, and Bundelkhand region (Madhya Pradesh) as potentially suitable habitat for Asiatic caracals. Output probabilities of pixels were further refined using vegetation height data. Our models inferred that there is a significant positive relationship between vegetation height and habitat suitability for caracal. This refinement reduced the potentially useful area to 567 km². We propose that these areas should be surveyed intensively to ascertain the presence of the species.

Assessment of spider assemblages, and their responses to grazing regulation in the Great Indian Bustard habitat of Thar Desert, Rajasthan

Rishikesh Tripathi

Invertebrates are understudied and their conservation is neglected. The dominant biodiversity conservation approach relies on Protected Areas and surrogate taxa for conserving co-occurring species. Rajasthan Forest Department is implementing habitat conservation actions for the Critically Endangered Great Indian Bustard (GIB) with technical inputs from the Wildlife Institute of India following MoEF&CC's National Bustard Recovery Guidelines. One of the restoration measures involve creation of enclosures to regulate livestock grazing with the aim of improving vegetation production that will perhaps increase invertebrate biomass and benefit bustards. However, the effectiveness of this action is largely untested. Here, we ask if GIB-centric habitat management, specifically fencing to reduce livestock grazing, benefits invertebrate assemblages that act as the primary food for GIB. We select spiders to address this question, because of their predatory functions and well-known indicator roles. By doing so, we ask a question of larger conservation relevance: does flagship-centric conservation benefit non-target taxa? This study is part of a longer-term proposed study to better understand these questions, and we present the preliminary findings of our study.

GIS based studies on population status of Oriental White Backed Vulture and their conservation strategies in Rawatbhata (Rajasthan)

Kiran Choudhary

The White backed vulture (*Gyps bengalensis*), a bird species characteristic of River Valleys, is categorized as critically endangered on the IUCN Red list. Largest population of Vultures is surviving in the cervices of Chambal Valley. Much of the mortality of eggs, chicks and adults are due to human related causes like habitat destruction and illegal mining. Conservation of this species in this region requires increasing awareness of people and their participation in the conservation of the species.

Present study is undertaken for GIS based population monitoring of WBV vulture at their nesting and feeding site. An attempt will also be made to monitor the effect of habitat change on the population status of this most threatened avian obligate scavenger. Further integrative conservation management will be undertaking. This yearlong campaign will help in spreading the message for conservation of river valley and the vultures and their importance for us.

Human wildlife relationship in Gujarat

Vishal Thakur

The relationship between humans and wild animals in Gujarat is seen to be smooth and slow going. But in last 10 years human wildlife conflicts have increased. Blue bull population have increased and thus farms are getting destroyed and bearing loss. Hanuman langur, black buck etc. also creates issues as herbivore animals destroy the fields. Among Gujarat's two big cat's Asiatic lion and Leopards, have created more problems for humans as per livestock attack and human attack. This problem has increased in rural and urban areas due to two reasons, leopard population increase in forest areas and thus leading to territory issues, and corridor disturbance due to large scale development in Gujarat. Saurashtra region (Junagadh, Amreli, Gir Somnath, Bhavnagar) witnesses' leopard and lions being in the same habitat. As per research it is noticed that fatal and non-fatal attacks were less in case of the lions as compared to that of the leopards. In last five years, southern Gujarat have witnessed minor increase in fatal and non-fatal attacks.

Study on the dispersal of Mugger crocodile (*Crocodylus palustris*) and impact of a hydroelectric power plant and gravity masonry dam on their migration at Ranapratap Sagar Dam on river Chambal, Rawatbhata, Chhittorgarh, Rajasthan.

Rajendra Chaudhary

Gravity masonry dams are high strength bearing dams that are constructed to hold back water using the material's weight capable enough to oppose the horizontal pressure of water pushing against it. Ranapratap Sagar dam is a medium-sized gravity dam heightened 177 feet (53.8 m) on the river Chambal, the catchment area is around 956 km² with a total capacity of 2,898,000,000 cubic meters. Mugger crocodile (*Crocodylus palustris*) is found in freshwater bodies and is listed as 'Vulnerable' category of International Union for Conservation of Nature (IUCN) red list and protected under Schedule I of Indian Wildlife Protection Act 1972. My study is focusing on the dispersal of Mugger crocodile (*Crocodylus palustris*) in the monsoon due to the high-water level in the catchment area and the release of water from the dam. From 2nd August 2019 till 6th November 2021 around 33 crocodiles of an average length of 8.89 feet are rescued from Rawatbhata town, Bhainsroadgarh town, and villages close to Bhainsroadgarh wildlife sanctuary and released back in the catchment area. The maximum rescues are done post monsoon. As seen downstream of the Chambal River, the gharials migrate a long distance for nesting. But not much is known about Mugger's migration. We suggest a study on understanding the migration behavior in Mugger by tagging them and using GPS tagging on a few individuals. This study will also

reveal the dispersal of the animal after the release of water through the dam.

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

Gaurav Dixit

Human-carnivore interactions (carnivore-related threats to human life, economic security or recreation) pose an urgent challenge worldwide because these interactions often put human communities against carnivores and against other humans who seek to preserve or restore wildlife populations. In this context, a 6-month project was designed to understand how the remote communities (at our field site) are coexisting with the leopards and other wildlife. Also, to record the nature of this coexistence, whether it is harmonical or disintegrating.

Once we understand the community through extensively designed open-ended interviews and the nature of coexistence through careful analysis of the collected data (both qualitative and quantitative), various measures and mitigation controls will be devised and implemented to finally establish a community-based conservation model. We will also deduce various factors which influence the perception of the community, both individually and collectively and the impact of this coexistence in their lives.

We plan to publish our work through scientific publications, reports to respective state forest department and national environment ministry, a short film/documentary and various non-scientific articles.

An integrated approach to prioritize opportunities for carnivore conservation in shared landscapes

Mahi Puri

Global land use change has resulted in the loss and fragmentation of habitats and amplified the pace of species extinction. With carnivores being disproportionately at risk of range contraction, restoration is an important strategy to counter the impacts of habitat loss and fragmentation. While protection of public lands has been the cornerstone of conservation, private lands can play an important supplementary role. India harbors 23% of the global carnivore species, threatened by a rapidly growing economy and high human densities. Using a social-ecological systems approach, we prioritized private agricultural lands for agroforestry in the buffer area of Pench Tiger Reserve. We applied systematic conservation planning tools and combined data on (1) habitat use of four carnivores (tiger, leopard, dhole, and sloth bear), (2) landowner willingness to modify land use through enrolment in an incentive-based program, and (3) monetary cost of program implementation, to identify priority areas for agroforestry based on their relative cost-effectiveness. Our integrated approach generated a configuration of priority areas that was markedly different than if we selected areas using ecological data only. Over an 8-year period, restoration of ~4,900, ~8,300 and ~12,000 acres through agroforestry was estimated to have a cumulative cost of USD 56 million, USD 95 million, and USD 140 million, respectively. Partnering with and incentivizing private landowners can expand the effective size of small and fragmented protected areas. Our approach can be applied to other shared landscapes, dominated by private ownership, to identify areas that deliver a compromise between ecological suitability, social acceptability, and economic viability.

Evaluation of habitat and human-sloth bear conflict in S-E Rajasthan and its solution

Krishnendra Singh Nama

In concern to the Indian subcontinent sloth bear (*Melursus ursinus Shaw*, 1791) occurs in a wide range of habitats including tropical forests, savannahs, scrublands and grasslands below 4,900 ft. Here, in Rajasthan they are found in dry deciduous forests. The sloth bear is considered as the most dangerous wild animal due to its' unpredictable behaviour and often attacks on human in forests. But in a decade these attack/conflicts are rising outside the forest areas too. The present investigation deal with human-sloth bear conflicts, as per standard methods and survey and in search of its mitigation measures. On behalf of preliminary studies, it can be assessing that the most of casualties can be reduced by restricting human entries into sloth bear habitats, avoiding camping and housing in their habitats especially near water sources. But proper habitat mapping is essential to confirm their presence in area. Further road accidents were common due to National Highway near the forest areas. It his highly essential to conduct the scientific management programs in collaboration with local inhabitants which will support the conservation of this species.

Population status and habitat ecology of Indian Grey Wolf (*Canis lupus pallipes Sykes*, 1831) in Hadauti region, Rajasthan

Urvashi Sharma

The Indian Grey Wolf is one of the top carnivores in the much of the plans and peninsular region of the country with the varied type of habitats with warm and dry conditions, it occupies grassland, scrublands of semi-arid regions and agro-forestry landscape. Wolves in the Hadauti region of Rajasthan are existing as small population facing numerous threats for their survival. Almost no information pertaining their ecology is available in this geographical part and this project is aimed to generate basic information on the wolf of the Hadauti region. Effective measures can only be adopted after mapping the species range and habitat assessment.

The study conducts extensive field work to identify major hotspots, occurrence and abundance, assess habitat status and threats, carry out conservation initiatives and outreach activities at local level through awareness programs. By considering the records of wolf presence in scientific literature and the occasional reports of wolf-human conflict, conducting questionnaires will, therefore, adapt to cover the vast landscape in a given time duration.

From your elephant in my village to my elephant in my village: Changing narratives of conflict by empowering local communities with site-specific strategies.

Venetia Sharanya

Change in land-use patterns has resulted in elephants finding new paths, often through human-dominated landscapes, bringing them in contact with farmers who are not accustomed to them. Here, we address the issue of human and elephant conflict and food security in regions where humans and elephants share space and resources by adopting village-level farming and lifestyle practices that are compatible with elephant use of the landscape, thereby, changing the dominant narrative of "your elephant in my village" to "my elephant in my village".

The distribution of Alien Invasive Species in the high-altitude Shola Grassland habitats of Nilgiris district in Tamil Nadu

Kumaran K

Impact of Invasive Alien Species (IAS) in native biodiversity and its ecosystem is a major concern globally. The tropical landscapes have undergone drastic changes in their land use and land cover (LULC) types. An understanding of this change is essential for the conservation and sustainable management of this landscapes. In this study, we briefly looked at the changes in LULC in the Nilgiris, which is part of the Western Ghats biodiversity hotspot. We used LANDSAT images for classification. Nearly 1500 ground control points, were collected for classifying the recent images. Exotic plant species such as Scotch Broom (*Cytisus scoparius*), Gorse (*Ulex europaeus*), Wattle (*Acacia mearnsii*) have become a major threat for various habitats in India. IAS are rapidly changing the grassland habitats resulted in altering species richness and diversity of native plants in the region. We observed a significant increase in built up land and agriculture with a reduction in the forests and grasslands. There is a need to understand impact of such a change in land cover on ecosystem processes and services.

Indian Soft-shell Turtle *Nilssonia gangetica* (Cuvier, 1825) in a community conservation reserve, Fatehabad, Haryana

Mehul Singh Tomar

A study was conducted in community pond of village Kajalheri, district Fatehabad of Haryana, *Nilssonia gangetica* (Indian soft-shell turtle), which is categorized as 'Vulnerable' in IUCN Red list and protected in Schedule I of the Indian Wildlife Protection Act, 1972 was found to be predominant species. Pond was visited multiple times in different season for 5 years (August 2015 to Feb 2020) for 14 man-hours. Visual observations were made that includes turtle numbers, behaviour, injury sign, size and nesting sign with binocular and camera. Data showed that number of adult individuals varies from 15 (winters) to 54 (summer). Feeding habits of turtle primarily includes the human food (Chappati, puffed rice, prasad prepared in temple, etc.) offered by visitors of the temple at community reserve. For this study turtle were divided into different size categories i.e., less than 30 cm (small), 30 cm to 60 cm (medium) and more than 60 cm (large) on the basis of ocular estimation and majority of the turtle belong to more than 60 cm category. Majority of turtles showed injury marks on different parts of the body (front legs, head and neck) that might be due to overcrowding, aggression and infighting during courtship and food etc. This study re-emphasised the role of such community conserved sites for survival of threatened species such as *N. gangetica*. We suggest a long-term monitoring, conservation and management plan need to be prepared.

Response of bird communities to land-use change in the Thar Desert

Varun Shriniwas Kher

The Indian Thar Desert has lost much of its grasslands over the last few decades, mainly due to land-use change from pastoralism to agriculture. Expanding croplands and intensifying grazing pressures are popularly hypothesized to be the major drivers of biodiversity loss in the region. Our study aimed to investigate the effects of contemporary land-use change on bird communities of the Western Thar Desert. We surveyed 59 randomly laid line transects in a ~2000 sq.km study area, to quantify parameters of bird community structure in three predominant land-cover types viz. protected-grasslands, rangelands, and fallow-croplands. Fieldwork for the study was conducted in the dry season (winter and summer) between December 2018 and April 2019. During winter, overall bird species richness and abundance was highest in protected-grasslands followed by fallow-croplands and rangelands. Protected grasslands also had a higher abundance of diet and habitat specialists. Compared to protected-grasslands, density was lower in fallow-croplands and rangelands for 35% and 10% of species, respectively. A majority of the negatively

affected species were insectivorous grassland-specialists. Contrary to the pattern in winter, overall bird species richness, abundance, composition, and guild structure in summer was similar across the three land-use types. Only one of the 17 analysed species had significantly lower density in modified land-use types. Our results point out that low-intensity agro-pastoral land-uses can supplement, but not replace, protected areas in conservation of Thar Desert's avifaunal diversity. This is in consonance with the idea of managing dryland habitats as agro-grassland mosaics with embedded protected areas surrounded by multiple-use matrix.

State of biological resources in Rajasthan and related Issues

Sunil Dubey

The talk will cover summary of the biological resources (plants and animals) in Rajasthan, geographical features determining their distribution; plants of medicinal and traditional importance in food and medicines; factors affecting the floral and faunal diversity in the state (including Alien Invasive Species), management of AIS with examples; some points on legislative provisions related to biodiversity and the state of implementation.

Establishing community managed Fish Conservation Zone (FCZ) in Manipur: Challenges and prospects

James V. Haokip

This presentation is an attempt to throw some light on the challenges faced and the future prospects of a Fish Conservation Zone in Manipur. In the year 2020, Khengjang -Yangoulen FCZ was established along Tuivang River in Manipur, stretching for 2.47 km. The FCZ is to be managed by the community members of the two villages. A survey was carried out to assess the Community Perception vis-à-vis the FCZ. A brief report about the community perception, activities in the river and the number fish species found in this conservation zone will be discussed in this paper so as to solicit inputs to successfully carry forward the said FCZ.



Fostering Grass-roots Conservation in India

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