2021-22
ANNUAL REPORT

भारतीय वन्यजीव संस्थान
Wildlife Institute of India

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WILDLIFE INSTITUTE OF INDIA

2021-22
ANNUAL REPORT

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Hon'ble Union Minister
Ministry of Environment, Forest & Climate Change
Government of India

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Hon'ble Union Minister of State
Ministry of Environment, Forest & Climate Change
Government of India

FROM THE DIRECTOR'S DESK

It is a pleasure to present the Annual Report of the Wildlife Institute of India (WII) for 2021-22. The Institute completed its major ongoing programmes during the reporting period. The planned schedules of both the M.Sc. programmes were completed during the period.

The regular training programme of the Institute, XLII Post Graduate Diploma in Advanced Wildlife Management, was ongoing. The mandated research activities were conducted as per schedule. A total of fourteen research projects were completed during the year. The research activities, especially under Compensatory Afforestation Fund Management and Planning Authority (CAMPA); The National Mission for Sustaining the Himalayan Ecosystem (NMSHE); National Mission for Clean Ganga (NMCG); and Tiger Cell continued.

The XVII M.Sc. (Wildlife Science) was completed. Teaching inputs were given in both the classroom and the field. All twenty students have successfully completed the course. The UNESCO Category 2 Centre at the Wildlife Institute of India also completed the first two-year residential Master's Course in Heritage Conservation and Management.

All the facilities and Cells at the Institute have contributed to the successful execution of various activities. The Institute provided advisory services to its stakeholders as and when required. Some short courses, workshops and seminars were conducted in online mode. Important events like Geography Week, GIS Day, Hindi Pakhwara, International Day for Conservation of the Mangrove Ecosystem, World Elephant Day, World Ozone Day, Wildlife Week and World Wetlands Day were celebrated by both online & offline modes.

All the activities were conducted in a planned manner. I wish to thank the Institute's governance and administrative committees for their valuable guidance and acknowledge all the stakeholders, faculty colleagues, staff, researchers and students for their contribution to the smooth conduct of the Institute's activities during the year.

(**Virendra R. Tiwari**)

20th March 2023

YEAR AT A GLANCE

The year 2021-22 was another year of hard work in the journey of the Wildlife Institute of India. The Institute conducted all its mandated programmes as per the planning despite looming pandemic threat. The regular courses were conducted with a slight change in their schedule. Research projects generated valuable scientific information. Their outcomes are presented in the Research Section of this report. The Institute carried out work on 61 research projects and completed fourteen of them during the reporting year.

On the academic front, both the Post Graduate programmes, *i.e*. M.Sc. (Wildlife Science) and M.Sc. (Heritage Conservation and Management) were completed as per schedule. The Institute conducts training programmes for in-service officials of Forest Departments. XLII Post Graduate Diploma in Advanced Wildlife Management was continued during the reporting period. Ten officer trainees of the rank of DCF/ACF participated in the course. The officer trainees learnt various wildlife management techniques, including estimating prey and predator populations, studying animal behaviour, carrying out radio-telemetry, chemical immobilization and restraint of wild animals, wildlife health monitoring, vegetation sampling, and habitat quantification and occupancy survey. The important days and events were celebrated by organizing online activities.

During the reporting period, thirty-three webinars, workshops, seminars, and short-duration training courses were organized for various stakeholders and participants. The faculty members and researchers contributed to many national and international peer-reviewed journals. They published 55 papers in Peer-Reviewed International Journals, 39 papers in Peer-Reviewed National Journals, and presented papers in various webinars. Besides these, 12 technical reports were also brought out by the Institute during the reporting period.

All the departments, cells and sections performed their role with complete dedication during the reporting year. This Annual Report covers all the activities mentioned above to present the overall picture of various activities during the reporting period.

ROLE AND MANDATE

Introduction

During the early eighties of the last century, there was a worldwide realisation that natural resources were diminishing at an alarming rate, and the environment was degrading very fast. At the same time, the understanding of environmental issues was still a little hazy, and the initial remedial responses to the complex ecological problems had mixed outcomes.

This realisation and need for conservation initiatives also brought into focus the inadequacy of skilled human resources for wildlife management and wildlife biologists to conduct research and overcome the lack of researched information for promoting proper conservation planning. A need was also felt for establishing an organisation that, through multi-disciplinary research at the field level, could help respond to the challenges of biodiversity conservation and develop holistic approaches for managing wildlife and habitats across the country and the region. This situation led to the setting up the Wildlife Institute of India (WII) at Dehradun in 1982.

WII is a premier training and research institution in the field of wildlife and protected area management in South Asia. In 1986, the Institute was granted the status of an autonomous institution by the Ministry of Environment, Forest and Climate Change (MoEFCC), Government of India. Since its inception, WII has had the benefit of collaboration with international organisations such as UNDP, FAO, USFWS, IUCN and UNESCO. These partnerships have helped the Institute build qualified faculty and staff through rigorous training and exposure to modern research and analytical techniques.

The Institute's vast array of capacity-building programmes provides a practical and realistic direction to the concept and practice of wildlife conservation. By learning from its own and others' experiences, WII is traversing a path of hope and aspiration, which will help strengthen finding answers in addressing wildlife conservation issues and challenges in the country and the South Asian region.

Our Mission

The mission of WII is to nurture the development of wildlife science and promote its application in the field in a manner that accords with our economic and socio-cultural milieu.

Aims and Objectives

- Build up scientific knowledge about wildlife, their habitat and conservation.
- Train forest personnel at various levels in the conservation and management of wildlife.
- Carry out research relevant to management, including the development of techniques appropriate to Indian conditions.
- Provide information and advice on specific wildlife management problems.
- Collaborate with international organisations on wildlife research, management and training.
- Develop as a regional centre of international importance for the conservation of wildlife and natural resources.

RESEARCH REPORTS

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KNOWLEDGE SUPPORT TO DEVELOPMENT OF GUIDELINES, SPECIALIZED FIELD STUDIES AND TRAINING ON HUMAN-WILDLIFE CONFLICT MITIGATION IN INDIA

COMPLETED PROJECT

Funding Source
Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

Collaborating Agency
Ministry of Environment, Forest and Climate Change, India and GIZ

Date of Initiation
July 2018

Investigators
Dr Dhananjai Mohan
Dr S.Sathyakumar
Dr C. Ramesh

Project Scientists
Dr Upma Manral
Dr Rishi Kumar
Aditya Bisht

Date of Completion
April 2021

Objectives

The project has the following objectives (i) supporting the development of National Strategy and Action Plan & SOPs, leading the state-level HWC mitigation guidelines for Uttarakhand, and supporting in Karnataka and West Bengal, in a participatory manner engaging all key stakeholders; (ii) support to the database on human-wildlife conflict in India; (iii) specialized field studies and other pilot measures at the project pilot sites in Karnataka, West Bengal and Uttarakhand; and (iv) Implementation of training and other capacity development measures engaging key stakeholders.

Progress

The project has four measures under which various activities and work were conducted as follows:

Project Measure A: Supporting the development of National Strategy and Action Plan & SOPs, leading the state-level HWC mitigation guidelines for Uttarakhand, and supporting in Karnataka and West Bengal, in a participatory manner, engaging all key stakeholders:

The WII team contributed to developing various chapters and sections of the National Strategy and Action Plan (NAP) after comments from National Technical Group (NTG) members, and the final document was released by the Ministry of Environment, Forest and Climate Change. Similarly, teams working on HWC mitigation guidelines incorporated comments and suggestions from NTG members and finalized zero drafts. The zero drafts for the HWC State Action Plan for Uttarakhand (SAP) and division-level HWC Management Action Plans (MAP) for project pilot sites in Uttarakhand, *viz*., Rajaji Tiger Reserve, Dehradun and Haridwar forest divisions were submitted.

Project Measure B: *Support to the database on human-wildlife conflict in India:* The work under this project measure had been completed by the WII team. A technical report has been prepared to look at the spatial-temporal patterns of HWC in Uttarakhand with an emphasis on conflict hotspots.

Project Measures C: *Specialized field studies and other pilot measures at the project pilot sites in Karnataka, West Bengal and Uttarakhand: The project team* led the development of division-level MAP for the Haridwar-Rajaji-Dehradun landscape, in line with the Common Framework for developing HWC management Action Plans shared by the GIZ team.

Project Measures D: *Implementation of training and other capacity development measures engaging key stakeholders:* A five-day Virtual 'Training of Trainers' course on 'Training Excellence and Human Wildlife Conflict Management' for the faculty members of State Forest Training Academies and Rangers Colleges was organized on April 22-23 and April 26-28 2021. The module on training excellence was conducted by a master trainer from Dale Carnegie, India.

Outputs and Outcomes

The National Action Plan was released by the Ministry of Environment, Forest and Climate Change. Final zero drafts of guidelines on conflict mitigation with

Crocodiles, bears, Blue bulls, Wild pigs, Rhesus macaques and Snakes, and Occupation Health and Safety were developed and shared with GIZ. In total, 155 frontline staff and members of Uttarakhand Forest Rapid and Primary Response teams were trained in various skills and tools for HWC mitigation. The movement of six-collared leopards and four-collared elephants is being monitored in the human-use landscape and various forest divisions of Uttarakhand by the trained personnel of UKFD. Thirteen faculty members of State Forest Training Academies and Rangers Colleges from across the country were trained in Training Excellence and Human-Wildlife Conflict Management.

Milestones

The policy documents were developed for mitigating HWC. It would be a crucial tool for HWC mitigation and management across the country. The trained workforce of the partner state (Uttarakhand) would strengthen the HWC management efforts in Uttarakhand and provide success stories.

COMPLETED PROJECT

MAINSTREAMING LANDSCAPE APPROACH TO BIODIVERSITY CONSERVATION, IMPROVED LIVELIHOODS AND ECOSYSTEM HEALTH IN KAILASH SACRED LANDSCAPE PART OF INDIA

Funding Source
National Mission on Himalayan Studies, Ministry of Environment, Forest and Climate Change, New Delhi through State Biodiversity Board, Uttarakhand

Investigators
Dr B.S. Adhikari
Dr G.S. Rawat

Date of Initiation
May 2018

Date of Completion
April 2021

Objectives

To strengthen community institutions, restoration of degraded habitats and management ecosystem and identification of critical ecosystems/habitats/ corridors and suggest evidence-based management plans on Biodiversity Conservation, Improved Livelihoods and Ecosystem Health.

Progress

The Indian part of Kailash Sacred Landscape (KSL) encompasses a wide range of ecosystems and habitats ranging from sub-tropical to alpine and subnival zones. Each habitat type comprises peculiar biophysical conditions to suit a single or group of species (floral and faunal communities) which are adapted to such conditions.

Outputs and Outcomes

During the reporting period based on floral and faunal assemblages, twelve important bio-corridors *viz*., Ramganga Riverine Corridor, Upper Gori - Pilti River Corridor Ghosi, Lower Gori - Ghosi - Kanar riverine Corridor, Budi - Palang Gad - Rongkong Corridor, Shandev - Humdhura Corridor, Namik - Khaliya - Poting Corridor, Rajramba - Buidhura - Dhunkhan Corridor, Burphu Dhura - Barjikang - Ralam Corridor, Chhiplakedar - Najuri - Balchi Dhura Corridor, Kalapani - Upper Kutti Corridor, Karangdang- Nasamarti Corridor and Dung - Untadhura - Girthi Corridor within Indian part of Kailash Sacred Landscape were identified and mapped. Each of these corridors has its own speciality, such as the dominance of orchid species, the presence of riverine forests, the high diversity of endangered species, and medicinal plants.

Milestones

Changes in the snow class were identified, which were low compared to other classes.

ATLAS OF COLONIAL NESTING WATER BIRDS IN THE EAST COAST STATES OF INDIA

COMPLETED PROJECT

Funding Source
Grant-in-Aid

Investigators
Dr G.V. Gopi
Dr Bivash Pandav

Researcher
D. Frank Sadrack Jabaraj

Date of Initiation
April 2017

Date of Completion
April 2021

Objectives

The objectives of the project are to (i) establish ecological baselines about each of the nesting colonies; (ii) assess the conservation threats to these identified colonial nesting waterbird colonies; and (iii) distinguish key colonial areas based on a number of species as well as a number of threatened species.

Progress

One hundred and one heronries were documented in the state of Tamil Nadu. About 18% of the nesting sites fall under the category of the protected area and 82% in the non-protected area. Among the 26 colonial nesting waterbird species in India, 19 species belonging to 6 families occur in Tamil Nadu. Of the nesting species, the Little cormorant is found to be the most commonly occurring species, followed by Little Egret, Black-crowned Night-heron, and Indian Pond heron. The least occurring nesting species are Indian Black Ibis, Great Cormorant, and Large Egret in Tamil Nadu. The species richness of nesting water birds was high in a protected area when compared with a non-protected area. Among the active heronries, the maximum number reported from Erode district (16) heronries, followed by Tiruchirappalli (14), Tirunelveli (12), Coimbatore (11), and Kancheepuram (9) districts.

A database on waterbird nesting colonies and the population status in the breeding sites for all the colonial nesting waterbirds in Tamil Nadu. The principal reason for identifying such sites is to attain their recognition, protection, and, when required, management. Baseline ecological information about the abundance of the nesting species, nesting habitats and protected area status etc., were documented for each of the nesting colonies occurring in the state.

Outputs and Outcomes

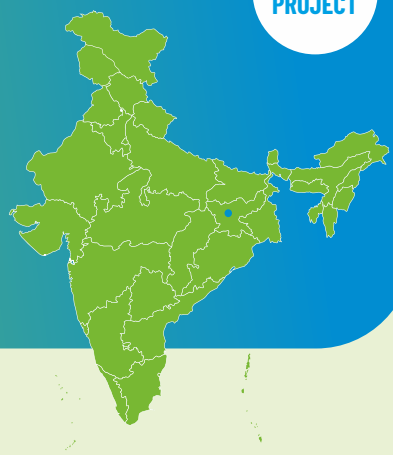
A state-level atlas of the breeding colonies in the form of a book was published for the benefit of interested academic, scientific, governmental, and non-governmental organizations and individuals. The final Report on the Atlas of colonial nesting water birds in Tamil Nadu was prepared and submitted to the PCCF & CWLW office in Chennai, Tamil Nadu.

Milestones

The present study was the first to cover the entire landscape of the state of Tamil Nadu, focusing on each district. Around 80 heronries are being reported for the first time in the state. About 12,000 wetlands were surveyed, and a systematic approach was followed covering both wetlands and non-wetlands. Five peer-reviewed publications were published from the project.

REVIEW OF SITE-SPECIFIC WILDLIFE MANAGEMENT PLAN IN RELATION TO THE DIVERSION OF 1007 HA. OF FOREST LAND FOR THE NORTH KOEL DAM PROJECT IN THE STATE OF JHARKHAND

COMPLETED PROJECT



Funding Source
Forests, Environment & Climate Change Department, Government of Jharkhand

Investigators
Dr G.V. Gopi

Researcher
Rohit R.S. Jha

Date of Initiation
April 2021

Date of Completion
June 2021

Objectives

The main objective of the project was to provide constructive comments and suggestions to improve the site-specific Wildlife Management Plan for the benefit of inhabiting wildlife that will be displaced/ disturbed by the North Koel Reservoir Project.

Progress

The Final Review Report, derived from a critical appraisal of the site-specific wildlife management plan and from a short field visit, comprising chapter-wise comments and suggestions towards improving the said Plan, was completed and sent to the Chief Wild Life Warden, Government of Jharkhand in July 2021.

Outputs and Outcomes

A comprehensive review of the history and progress of the North Koel Reservoir Project *vis-à-vis* its present situation in the context of inhabiting wildlife. A comprehensive 234 pages chapter-wise review of the site-specific Wildlife Management Plan with several appendices and supporting information towards improving the said Plan for the benefit of Palamau Tiger Reserve's forests, wildlife and inhabiting people was prepared.

Milestone

Field-visit to Palamau Tiger Reserve (PTR) was done from 15 April-2 May 2021, to understand ground realities and interact with stakeholders.

Figure 1: *A view of the almost complete Mandal dam on the North Koel River near the village Kutku, Palamau Tiger Reserve (PTR) (image credit: Rohit Jha)*

Figure 2: *A typical Sal-dominated (Shorea robusta) forested patch within PTR on a hilly slope (image credit: Rohit Jha)*

STUDY TO ASSESS THE IMPACT OF POWER LINES ON AVIAN SPECIES IN AND AROUND DEEPOR BEEL RAMSAR SITE, ASSAM

COMPLETED PROJECT

Funding Source
Assam State Forest Department

Investigator
Dr R. Suresh Kumar

Researcher
Dipanjali Gohain

Date of Initiation
December 2020

Date of Completion
July 2021

Objectives

The objectives of the project are to (i) determine the spatial distribution of select avian species of conservation significance in the Deepor Beel Wetland and (ii) monitor and assess the impact on avifauna due to the existing power lines in and around Deepor Beel Wetland.

Progress

The study undertook extensive surveys for birds and assessed the impact of power lines in the area on birds. The project has been completed, and the final report has been submitted to the Assam State Forest Department.

Outputs and Outcomes

High-risk power line stretch posing the risk of collision to birds has been identified. Similarly, power pole configurations posing a significant risk of electrocution to birds were also identified. Suitable mitigation measures to reduce the risk of collision and electrocution have been suggested.

Milestones

This is the first such study at this site and was taken up following a request from the Assam State Forest Department. The study determined areas in the Beel with high diversity and abundance of select avian species groups, specifically those that are known to be impacted by power lines. Additionally, the power lines, both transmission and distribution lines in the area, were mapped and characterized and also assessed for their collision and electrocution risk to birds.

INFLUENCE OF MICRO-CLIMATIC VARIABLES ON HERBACEOUS PLANT COMMUNITIES IN TREELINE ECOTONE IN THE HIMALAY

COMPLETED PROJECT

Funding Source
National Mission on Himalayan Studies, Ministry of Environment, Forest and Climate Change, New Delhi through CHEA, Nainital

Investigator
Dr B.S. Adhikari

Researcher
Rahul Kumar

Date of Initiation
April 2016

Date of Completion
September 2021

Objectives

To understand the impact of the depletion of snowmelt water on the composition and selected functional processes of herbaceous species.

Progress

The current ongoing and projected warming trends across the globe have become a source of great concern for scientists and land managers. These calls for prioritizing studies to provide a solid understanding of complex environmental changes, especially in relation to ecological processes. Given global trends showing an expected upward shift of treelines and timberlines across the globe in both elevation and latitudes, it becomes imperative to study the effect of warming on ecological processes, especially understanding the dynamics of treelines and timberlines and coupling with biosphere components to develop climate change indicators and mitigating strategies. The study area was divided into four sites to understand the influence of snowmelt water on the herbaceous community of treeline and alpine meadows. For the natural snowmelt experiment, each study site was further divided into three zones, namely timberline zone (3,200-3,300m asl), treeline ecotone (3,300-3,400m asl) and alpine zone (3,400-3,600m asl).

Outputs and Outcomes

The results of the natural snowmelt experiment conclude that the interactive effects of snowmelt with altitudes and microhabitats heavily influence the richness, density and diversity of herbaceous communities. This, in the future, may lead to an increase in richness and diversity across altitudes in both treelines and alpine meadows. Furthermore, early snowmelt heavily influences species' phenology, with most plants showing early phenophase initiation with advances in snowmelt timing. The increasing warming temperature is also influencing species phenophase. A comparison of 13 species with past records indicates that the phenophases duration of species has increased (especially vegetative growth period in 77% of species and flowering in 69% of species). Although the phenophase behaviour of different species in the past varies, some species, especially alpine restricted, show extended phenophases, namely *Oxygraphis* and *Pedicularis* (3.5 months), *Anaphalis* (2 months), *Selinum* and *Potentilla* (1.5 months), *Geum* (3-4 weeks) and *Parnassia* (3 weeks).

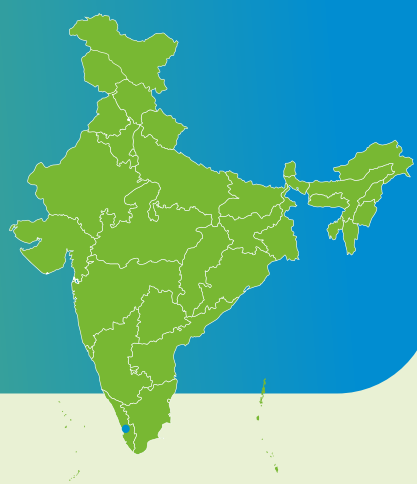
A baseline database was created encompassing information on the diversity and phenology of herbaceous species in timberline, treeline and alpine meadows of the Tungnath region. Innovative technologies such as Open Top Chambers (OTC) based experimental setup was established in alpine meadows to understand warming and snowmelt influence on herbaceous phenology and identify key drivers to changes in structural and functional properties of communities.

Milestones

The data generated has given key insights on the interactive effect of altitude and snowmelt on micro-habitats dominated by different herbaceous plant communities and snowmelt, on structural and functional properties of alpine/treeline communities along with herbaceous species phenological adaptations to early snowmelt and warming.

COMPLETED PROJECT

TO DEVELOP THEMATIC MAPS FOR KOCHI AND DEVELOP POLICY RECOMMENDATIONS FOR THE CITY AUTHORITIES UNDER THE INTEGRATED SUB-NATIONAL ACTION FOR BIODIVERSITY: SUPPORTING IMPLEMENTATION OF NATIONAL BIODIVERSITY STRATEGY AND ACTIONS PLANS (NBSAP) THROUGH THE MAINSTREAMING OF BIODIVERSITY OBJECTIVES ACROSS CITY-REGIONS (INTERACT-BIO)



Funding Source
ICLEI South Asia

Investigator
Dr Gautam Talukdar

Researcher
Sneha Pandey

Date of Initiation
March 2020

Date of Completion
September 2021

Objectives

The objectives of the project are (i) Mapping of Blue-green spaces of Kochi City; (ii) Listing important and threatened biodiversity in Kochi City; (iii) Identifying the ecosystem services of blue-green spaces and livelihood dependence on prioritized ecosystems in Kochi; and (iv) Mapping Urban Heat Islands.

Progress

Blue-green spaces in Kochi city, which include the surface water resources, natural or man-made, are mapped using the combination of the Natural Asset map of the city and other green spaces (computed by using the Normalised Difference Vegetation Index or NDVI). NDVI data for the March-May 2021 period was obtained from Sentinel-2 satellite imagery (10m spatial resolution). Mean NDVI values were calculated, and a threshold value of 0.16 was used to delineate the green space based on limited ground-truthing from Google Earth images of the study area. Thus, blue-green spaces represented the following classes - backwaters, rivers, canals, ponds, inland pisciculture, cultivation land, mangroves and marshes, and other green spaces.

As a part of this project, a list of threatened biodiversity was prepared. The Wildlife Protection Act (WPA, 1972) and the International Union for Conservation of Nature (IUCN) red list status were used to filter the important/threatened species in the wild from the species list given in the City Biodiversity Index (CBI) of Kochi and Global Biodiversity Information Facility (GBIF) mediated data. Experts were consulted to validate the list of important/ threatened species. The habitats for threatened biodiversity were derived from natural asset maps using habitat data collected from IUCN. The wards were classified into three categories based on the area of the habitat available in each ward.

A list of ecosystem services provided by blue-green spaces and a map depicting livelihood dependence on prioritized ecosystems in Kochi city was prepared. Among the nine key focus areas mentioned in the Local Biodiversity Strategy and Action Plan, four categories (prioritized ecosystems) with high levels of floral and faunal diversity were used to map the livelihood dependence. The four categories were computed ward-wise to ascertain the area available for livelihood dependence. Subsequently, an unstructured questionnaire was used to determine the livelihood dependence on the four prioritised ecosystems.

The images from the Landsat 8 satellite were used to prepare the LST maps. Data was acquired for the month of January over four consecutive years during 2017-20, as January is usually cloud-free and the coldest period of the year in Kochi. The range of LST identified urban Heat Islands and Urban Heat Spots by using a split-window algorithm. The field visit was conducted in Kochi for data collection and validation of maps. The project report has been submitted.

Outputs and Outcomes

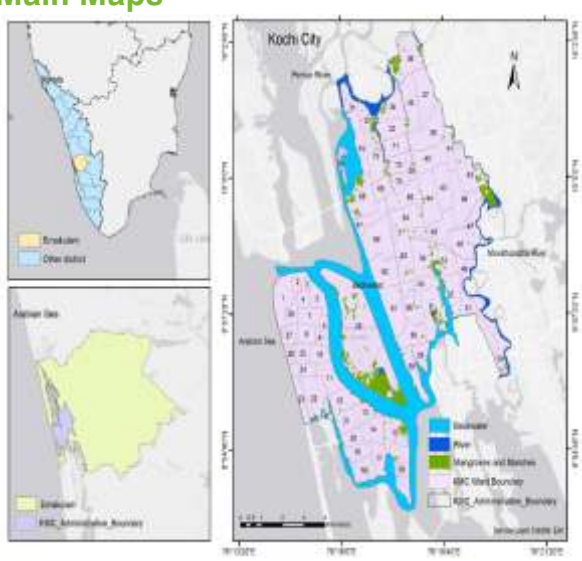
The research team developed maps of blue-green spaces in Kochi city, ward-wise distribution of blue-green spaces were calculated, and suitable policy recommendations were framed in order to conserve and protect the blue-green spaces. The maps for habitats for important/threatened biodiversity in Kochi city; and Livelihood dependence on prioritized ecosystems in Kochi and Urban Heat Islands and Urban Heat Spots in Kochi are also prepared. A list of ecosystem services on blue-green spaces and livelihood dependence on prioritized ecosystems in Kochi city region. Policy recommendations are framed for the city authorities of Kochi for integrated urban planning using Nature-based solutions and other alternative

Milestones

The project highlights some of the important ecological aspects in urban areas. The team identified the prioritised ecosystems in Kochi city and prepared a list of threatened biodiversity and ecosystem services in the city. Comprehensive policy recommendations have been framed, not only to conserve and protect the existing blue-spaces in Kochi city but also to increase these spaces within the urban agglomerations using Nature-Based solutions.

Mitigation strategies based on Nature Based Solutions for reducing the Urban Heat Island effect have also been proposed to the city authorities of Kochi.

Main Maps



ECOLOGICAL RESPONSES OF FLORA AND FAUNA TO CLIMATE CHANGE IN TRANS-HIMALAYAN LANDSCAPE WITH SPECIAL REFERENCE TO VULNERABILITY AND ADAPTATIONS

COMPLETED PROJECT

Funding Source
NATCOM, Ministry of Environment, Forest and Climate Change, New Delhi

Investigators
Dr B.S. Adhikari
Dr S. Lyngdoh

Researcher
Kalzang Targe

Date of Initiation
July 2018

Date of Completion
December 2021

Objectives

To understand the nature of vulnerability to climate change adaptation by the local pastoral communities - Livelihood and Natural resource dependence *vis-a-vis* vulnerability.

Progress

Himalayan ecosystems have been shown to have a greater and more rapid response to warming scenarios and are also influenced by human activities. Climate change is an important concern in

the Himalayan region because of its potential impacts on the culture, socio-economic status of adjoining communities, and associated environment. Livestock grazing and other anthropogenic disturbances can cause the competitive exclusion of wild animals from high-quality habitats. The wild ungulates are a major constituent of Trans-Himalayan mammalian fauna, and they are also the major prey base for large mammalian predators.

A significant portion of the Pin Valley National Park (PVNP) is flanked by historically resource-dependent communities. Eight villages from Spiti valley are dependent on fuelwood, fodder, livestock grazing and farming in varying degrees. However, the traditional pattern of resource utilization in terms of uprooting and collection of shrubs and herbs, intensive livestock grazing by migratory livestock and, to a lesser extent, local livestock and dung collection is probably going beyond sustainable limits in Ladakh. Considering these factors, the study was designed to help and focus on doing experimental studies to know the response, cause, and mitigation strategies to sustain the changing climate along with the vulnerability and adaptations.

Outputs and Outcomes

The Trans-Himalayan region being in a rain shadow zone, supports mainly the graminoids and small herbs in low abundance with perennial rootstocks in habitats like desert steppe, scrub steppe and wet meadows. Some alpine meadows or pasture lands are replaced by glacial moraines with unique floristic elements.

Climate change has impacted the cultural and socioeconomic status of communities and the associated environment in trans-Himalaya. The traditional pattern of resource utilization in terms of grazing, and uprooting of shrubs and herbs for fuelwood and medicinal plants, respectively, have impacted alpine meadows, unique in floristic elements. The local communities' broader biophysical and socio-economic characteristics are interconnected with the vulnerability brought on by climate change.

Milestones

The Livelihood Vulnerability Index indicates that the rate changes even within the group of people living in the same landscape or adopting similar grazing patterns, livelihood practices etc. Moreover, the study supports that the vulnerability to climate change does not exist in isolation from wider biophysical and socio-economic attributes of the communities.

MONITORING OF REINTRODUCED GAUR *BOS GAURUS GAURUS* IN BANDHAVGARH TIGER RESERVE, MADHYA PRADESH, PHASE II - EXTENSION (2018-22)

COMPLETED PROJECT

Funding Source
Madhya Pradesh Forest Department

Investigators
Dr Parag Nigam, Dr Bilal Habib, Dr Samrat Mondol and Field Director, Bandhavgarh Tiger Reserve

Researcher
Ritesh Vishwakarma

Date of Initiation
November 2018

Date of Completion
March 2022

Objectives

The objective of the project is to (i) evaluate the habitat-use pattern of gaur and recently colonized elephants and Identify the suitable habitat of gaur in Madhya Pradesh state, (ii) assess resource competition of recovering gaur population with existing herbivore and colonized elephants, (iii) evaluate the genetic structure of recovering gaur population in BTR to formulate strategies for effective management, (iv) understand the mechanism of disease spread within and between gaur herds using social network analysis..

Progress

A genetic study was conducted using non-invasive approaches, and fresh dung samples were collected for DNA study. Focal animal sampling was conducted in the field where already identified animals were followed, and fresh dung samples were collected immediately after defecation by respective individuals. A total of 64 dung samples from identified animals were collected during the study. A set of 23 bovid microsatellite markers were standardized to develop a suitable panel for the genetic assessment of the BTR gaur population. Each of the markers was individually standardized with tissue and dung DNA samples. PCR amplifications were performed using a standardized lab protocol, and the samples were genotyped. Finally, a set of nine markers were used to generate data from individual samples. Following individual identification, the research team generated sufficient data from 59 individuals to perform an analysis.

Hierarchy-based behavioural data of gaur interaction was recorded to perform social network analysis. Behavioural data collection was occasionally supplemented with ad *libitum* sampling to collect social interaction (*i.e*. grooming and aggression). The data were analysed using MATLAB to derive interaction and network statistics. In the social network, the gaur contact interactions had a single giant component where all the individuals were connected to other individuals directly or via intermediate animals. The social network formed by individuals in this population was extensive and well-connected. Further, some of these interactions either occurred only a few times or were of concise duration. The analysis revealed a typical cluster of sub-adult males and sub-adult females. These clusters represented one or more social units within a herd (sets of individuals with more ties to one another than those outside the set). The clustering of the sub-adult population suggests that even if the gaur lives in a highly complex society, the herd do not display extensive social affiliations between clusters.

Outputs and Outcomes

The genetic study showed that the markers have a relatively low polymorphism in the Gaur individuals. Summary statistic measures showed low average allele number (4.6 SD 1.15), allelic size range (16.8 SD 8.9) and observed heterozygosity (0.20 SD 0.09). Overall PIDsibs value was found to be 6e-04, suggesting unambiguous individual identification of gaur using these markers. Qualitative analysis of demography using BOTTLENECK indicated strong signatures of population decline (8 of the nine loci showed heterozygosity excess, indicating a strong bottleneck). The Garza-Williamson Index corroborated the sample pattern, where a value of 0.30 (SD 0.11) was observed, suggesting a recent population decline. Multiple analyses of the inbreeding coefficient indicated high inbreeding within this population. All of the information suggests a strong corrective measure for the genetic rescue of this population by introducing new animals to this population before any adverse effects of strong inbreeding are observed.

The social network analysis of gaur society revealed that all individuals were centred and clustered within the herd except for the sub-adults that stood out from the groups. The preferred association and the number of encounters within the network were dominated by 'female-female interactions' and 'adult females-calf interaction', followed by 'male-female interactions'. However, some interactions (calf-calf association) were equally preferred and found to be frequent. The grooming networks 'degree distributions' for gaur with information transmissions varied across the individuals. The direct interaction (in the grooming network) may be linked to disease transmission as the animals interact in a particular pattern. The calculated 'degree distribution' results show that the matriarch and the sub-adult (both male and female) individuals have higher 'outdegree' and are vulnerable to transmission of information or diseases within the herd. The calves had higher 'indegree' than other individuals except with that the matriarch. The analysis revealed that gaurs with high 'flow-betweenness' ratings or individuals that function as connections between two or more individuals but are not directly related had a lesser risk of contracting the disease

Milestones

The genetic study of the gaur population suggests that it would be ideal for bringing some new individuals from a fresh genetic pool, increasing the genetic variation, and establishing genetic connectivity with other populations, possibly with Achankmar WLS. Protection of existing corridors

needs to be improved and anthropogenic pressures reduced. Further demography-based tests show a strong bottleneck in the current population. The inbreeding value (F=0.7) for the Gaur population shows a highly inbred population. The population requires immediate attention to ensure genetic connectivity, which induces gene flow and enhances genetic variability. Further isolation and devoid to admixture of the population may lead to a decrease in genetic variation and reduce adaptability of the population, leading to higher susceptibility to diseases. The study provided crucial recommendations based on the genetic inference that given the current genetic status of the Gaur population in Bandhavgarh, it would be ideal for bringing some new individuals from a fresh genetic pool to supplement this population and increase the genetic variation of the existing one. The study steered important management recommendations for maintaining the reintroduced gaur sourced from a single population or from a similar gene pool.

The social network study on disease transmission dynamics suggests that the risk of disease transmission is likely to increase with the duration of grooming between individuals. It is also informed that the risk of transmission varied between different age classes (body size), social status and reproductive status having different indegree and outdegree of individuals. The current study also identifies the various network centrality and directionality of transmission (indegree and outdegree) on all the individuals contributing to the grooming network within the herd. These parameters (indegree and outdegree) form clusters of individuals within the herd. In contrast, the tendency to share connections and formations of highly clustered social networks tends to slow disease spread. The study also helped explain why the most socially engaging individuals (the dominant male and female) are not always the most at risk of infection. The current study identifies the unprecedented facts on disease spread within and between herds and also provides important recommendations for managing diseases in group-living animals.

LINKING PROTECTED AREA NETWORKS AND NEAR REAL-TIME RAIN-BIRD LOCATIONS WITH IBIN

COMPLETED PROJECT

Funding Source
Department of Biotechnology and Department of Space

Investigators
Dr Gautam Talukdar
Dr R. Suresh Kumar

Researcher
Debanjan Sarkar

Date of Initiation
March 2018

Date of Completion
March 2022

Objectives

The objectives of the project are to (i) arrive at common schemas and understanding of the data exchange modalities for Protected Areas; (ii) synthesize the lessons learnt in protected areas; and (iii) near real-time monitoring of the “rain bird” predicting the Indian Monsoon and linking it to IBIN.

Progress

The research team has developed common schemas for different attributes so that the protected area information and metadata can be incorporated into the web map services of the IBIN portal. A document has also been prepared to describe the database on protected areas of India as well the schema of the database. The database of protected areas of India has been submitted along with the metadata, standard schema & manual of the database, which will be incorporated into the IBIN web-portal as a web service for further analysis. The research team tagged two individuals of Pied Cuckoo (Chatak and Megh) on July 2020 Argos solar PTT to track its migratory pattern.

Outputs and Outcomes

One tagged individual (Megh) covered approximately 5,000 km distance. The bird took stopovers near Rajaji National Park, Uttarakhand and on the Maharashtra Coast of India. The tagged individual started crossing the sea. The research team received 5 location fixes on the Arabian Sea. The last location fix of the individual was received near the coast of Somalia, Africa.

Milestones

Pied Cuckoo tagged with 2gm satellite transmitter for the first time. The study provides the first evidence that once the southeast monsoon recedes; Pied Cuckoo travels from India to Africa by crossing the Arabian Sea..

CONSERVATION MANAGEMENT OF ELEPHANTS IN CHHATTISGARH: CAPACITY BUILDING INITIATIVE ON THE DISPERSAL AND RANGING PATTERNS OF ELEPHANTS FOR EFFECTIVE MANAGEMENT OF HUMAN - ELEPHANT INTERACTIONS

COMPLETED PROJECT

Funding Source
Chhattisgarh Forest Department

Investigators
Dr Parag Nigam, Dr Bivash Pandav, Dr Samrat Mondol and Dr Bilal Habib

Researcher
Vijay Babu Nandwanshi

Date of Initiation
July 2017

Date of Completion
March 2022

Objectives

The main objectives of the project are (i) assessment of home range, dispersal and movement patterns of elephants, (ii) to assess habitat selection by elephants, (iii) to assess spatiotemporal dynamics of human-elephant conflict and identify locations that are predisposed to high intensity of conflict, (iv) development of early-warning systems (v) to assess the efficacy of conflict mitigation methods, and (vi) enhancing capacity of frontline staff in managing human-elephant conflict.

Progress

During the period, two elephants (two cow elephants, Maitri and Mohini) were GPS-satellite collared in Surajpur Forest Division in October 2021. Both the collared elephants, along with the previously collared bull elephant CGM001 were intensively monitored during the project period. Further to this, 12 village-level stakeholder workshops and training programs were conducted. Two workshops were conducted, resulting in the training of 108 officials. The data collected during the project period were analyzed, and the final report was prepared and submitted to Chhattisgarh Forest Department in July 2022

Outputs and Outcomes

The four-year project has been an effort towards a holistic understanding of elephant ecology, behaviour, and aspects of human-elephant conflict in Chhattisgarh. The project has helped in collecting baseline information on elephant distribution and demography. A total of 10 elephants were radio-collared as part of the project. As elucidated in the report, the data collected from radio-collared elephants in the State provided crucial fine-scale information on the ranging behaviour and dispersal patterns of elephants across northern Chhattisgarh. The study also provided important insights into crop losses and human deaths caused by elephants.

Milestones

The report emanated from the study lists pragmatic management approaches to mitigate human-elephant conflict in the state. The report also provided immediate and long-term perspectives on managing human-elephant conflict besides critically evaluating the current management practices followed by Chhattisgarh Forest Department. The project was instrumental in developing the institutional capacity of the Chhattisgarh Forest Department in dealing with human-elephant conflict. The capacity enhancement in the State was achieved by the active engagement of field personnel in project activities and through structured training programs carried out at different organizational levels of the Forest Department, which would certainly be pivotal in managing human-elephant conflict in the State in the long-run.

TAXONOMIC AND ECOLOGICAL STUDIES ON ARACHNIDS OF TRANS AND WESTERN HIMALAYA, INDIA

COMPLETED PROJECT

Funding Source
Ministry of Environment, Forest and Climate Change

Investigator
Dr V.P. Uniyal

Researcher
Irina Das Sarkar

Date of Initiation
January 2019

Date of Completion
March 2022

Objectives

The objectives of the project are (i) Detailed taxonomic studies and systematic assessment of Spiders diversity along altitudinal gradients across Western Himalayan, India; (ii) Establishment of a geospatial and genetic digital database of Spiders; (iii) To develop a team of para-taxonomists engaging local communities through local level capacity building among students, teachers and NGOs in long-term monitoring through training programmes and publications..

Progress

A detailed review of the state of taxonomic knowledge of spiders at the national level was done. A detailed review of the state of Araneae documentation was done for Himachal Pradesh, with identified gaps to bridge with further research. Preliminary level (family and genus) assessment of spider diversity was carried out in two PAs and their respective buffer regions in Himachal Pradesh: Bandli Wildlife Sanctuary (District: Mandi), Great Himalayan National Park Conservation Area (GHNPCA) (District: Kullu).

A Digital Elevation Map of the state of Himachal Pradesh covering all districts and the entire elevational gradient of the state was prepared. Reconnaissance sampling points were identified in three representative districts: Mandi, Kullu, and Lahaul-Spiti, covering an ecologically sound elevational gradient to carry out the systematic sampling.

Bilingual posters were prepared for the dissemination of knowledge regarding the ecological and agricultural importance of spiders among common masses to aid scientific curiosity to sustain long-term monitoring. Sampling protocols and strategies were developed to assess ecological heterogeneity and health of the study area to aid in long-term ecological monitoring throughthe assessment of changes in Araneae communities.

Awareness and sensitization workshops were organized at middle school, high school, and forest department levels for arachnological cognizance

and biodiversity knowledge dissemination in the eco-zone of GHNPCA. Preliminary identification and field training of para-taxonomists was organized to aid in the long-term independent collection of Araneae samples from GHNPCA.

Outputs and Outcomes

Introductory level (family and genus) assessment of spider diversity in two PAs and their respective buffer regions in Himachal Pradesh: Bandli Wildlife Sanctuary (District: Mandi), Great Himalayan National Park Conservation Area (District: Kullu) was completed.

An extensive survey of available Araneae literature from the country, sourced through the World Spider Catalog (21.5), revealed the fragmented and scattered state of knowledge of spiders of Himachal Pradesh. With the exception of Bastawade (2008), no other protected (or non-protected) area had been systematically sampled to ascertain a comprehensive bio inventory of spider fauna, highlighting the most urgent need to invest in building a sound taxonomic database for the state.

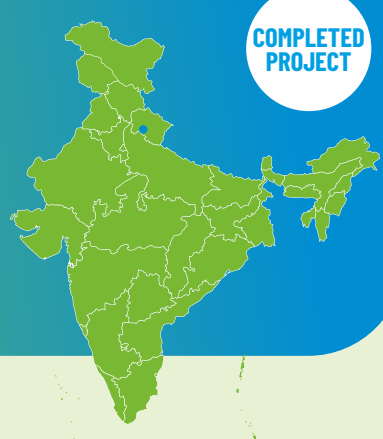
Several extensive surveys were undertaken in the core and eco-zone of GHNPCA and Bandli WLS to assess spider richness across various guilds and micro-habitats. The preliminary data appears low on richness but high on genus-specific abundances. This can be attributed to winter, and post-winter sampling opportunities, wherein Palearctic species (such as Lycosidae) and species co-habiting human-dominated landscapes (such as Araneidae and Tetragnathidae) were commonly encountered. The present report gives an annotated checklist of recorded spider species (primary data and secondary literature records. The research team reported 113 species/ morphospecies, predominantly identified till the genus level, across predominantly identified till the genus level, across 23 families. The report also notes 13 species flagged as operational taxonomic units (OTUs) from 6 families that need further intensive evaluation to accurately place under a finer taxonomic hierarchy. Spider diversity from PAs (assessed up to 1,500-2,700m elevation) revealed similar patterns of genus dominance of certain spiders. Generic dominance could be attributed to the homogeneity of habitats (Pine and Deodar in GHNPCA vs anthropogenically induced floral homogenization in Bandli WLS), which may have aided certain species to flourish over other conspecifics. Low richness counts could be attributed to restricted temporal sampling opportunities and are expected to be higher across wider spatial and temporal scales.

Milestones

Detailed review of the state of taxonomic knowledge of spiders at the national level was done. A review of the state of Araneae documentation with identified gaps to bridge with further research for Himachal Pradesh was also done.

BIODIVERSITY OF AN URBAN GREEN SPACE - AN INVENTORY OF THE FLORA AND FAUNA OF THE IIT ROORKEE CAMPUS, UTTARAKHAND

COMPLETED PROJECT



Funding Source
IIT Roorkee

Investigators
Dr R. Suresh Kumar and contributions from others

Researcher
Sachin Rawat

Date of Initiation
July 2021

Date of Completion
March 2022

Objectives

The objective of the project was to inventory flora and fauna in the IIT Roorkee campus.

Progress and Outcomes

The project has been completed, and the final report of the same has been submitted to the Indian Institute of Technology, Roorkee.

The floral diversity of the IIT Roorkee campus comprises 304 species. A rare herbaceous medicinal plant, *Typhonium inopinatum* was recorded on the campus and is the second record of the species for the Uttarakhand state. Invertebrates recorded include - 68 species of butterflies, three species of Cicadas, three species of Odonates, 36 species of ants and 57 species of Spiders. Interesting records of vertebrates include five amphibians' species and six reptiles, 57 avian species and six mammal species. The inventory was made into a small book that would also act as a field guide for species identification to be used by the residents of IIT Roorkee and visitors to the campus.

Milestones

This biodiversity inventory of the IIT Roorkee campus was released on the occasion of the institute's 175th Foundation Day. It was initiated to create an inventory of the floral and faunal wealth of the campus. It is probably the first document that highlights the diversity of the campus, which also led to the publication of the book titled "Biodiversity of an Urban Green Space - An Inventory of flora and fauna of the IIT Roorkee Campus, Uttarakhand" in the year 2022.

WILDLIFE SURVEY IN THE STATE OF HARYANA

COMPLETED PROJECT

Funding Source
Haryana Forest Department

Investigator
Dr Bilal Habib

Researchers
Dr Athar Noor, Nidhi Goyal, Ankita Sharma and Neha Yadav

Date of Initiation
November 2020

Date of Completion
March 2022

Objectives

The objectives of the project were to (i) estimate the carnivore population using camera trap and sign survey; (ii) estimate the ungulates population through line transect; (iii) estimate the population of Rhesus Macaque, *Macaca mulatta* outside the protected area using the mobile application "Wildlife Census Haryana"; and (iv) assess the Habitat characteristics inside the protected area.

Progress

A Survey protocol was made and submitted to the Forest Department of Haryana. Training programs for the forest staff were conducted in four forest circles of Haryana, Panchkula (North Circle), Hisar (West Circle), Rohtak (Central Circle), and Gurugram (South Circle). A population survey of Rhesus Macaque of complete Haryana was done using the Mobile application "Wildlife Census Haryana", and a report has been submitted. Wildlife estimation, especially of carnivores, was done in Kalesar National Park (Yamuna Nagar), Khol-hi Ratan Wildlife Sanctuary and Bir Shikargah Wildlife Sanctuary (Panchkula) using Camera Traps from January to March 2022. Line transect, sign survey and vegetation sampling were also done in Kalesar National Park and Bir Shikargah Wildlife Sanctuary. A report on the abundance and density estimation of wildlife present inside and outside the PAs of Haryana was prepared.

Outputs and Outcomes

A survey for the Rhesus Macaque population was done successfully using the mobile application, and a total of 175 troops were identified, having a total population of 6,776 in the State. The carnivore and herbivore populations of protected and unprotected areas of Haryana were estimated. Vegetation analysis of protected areas of Haryana was done

Milestones

It was the first monkey count study of Haryana state, and also, it was the first time that such kind a mobile application was used for any wildlife survey and especially outside the protected areas where it is a bit challenging to estimate the wildlife population. For the first time, camera trapping was done in all the protected areas of Haryana. The herbivore population of protected and unprotected areas was estimated. A report of all the wildlife present inside the Protected Areas as well as outside the protected areas was prepared.

Figure: *Training to Forest staff of Haryana*

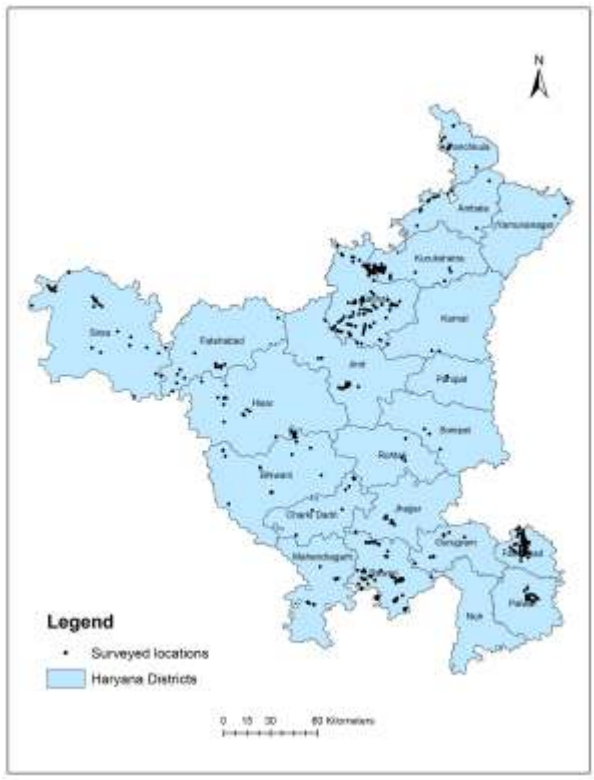


Figure: *Location of Macaque recorded in Haryana*

SATELLITE TRACKING AMUR FALCONS, *FALCO AMURENSIS* FROM THEIR STOP-OVER SITES IN MANIPUR TO SUPPORT CONSERVATION EFFORTS

ONGOING PROJECT

Funding Source
Manipur State Forest Department

Investigator
Dr R. Suresh Kumar

Date of Initiation
October 2018

Proposed Date of Completion
June 2022

Objectives

The objectives of the project are to (i) deploy modern technology in the form of lightweight satellite tags fitted to four Amur Falcons in Manipur to track their amazing migration journeys and to support conservation efforts; and (ii) carry out a state-wide survey to locate and identify Amur falcon roost sites.

Progress and Outcomes

The project has been completed, and the draft report of the same has been submitted to the Manipur State Forest Department. The study led to the satellite-tracking of two Amur Falcons in 2018, followed by tagging of five more Amur Falcons in 2019. Of these, four Amur Falcons, namely, *Tamenglong, Irang*,

Chiulon and *Barak*, could be tracked. A total of 9,894 locations from the four-satellite tagged Amur Falcons were collected during their period of tracking.

The falcons *Irang* and *Chiulon* made three successful trips to the non-breeding grounds and two to the breeding grounds, and both ceased transmission at their non-breeding grounds in Dec 2021 and Feb 2022, respectively. At the breeding grounds in China, *Irang* and *Chiulon*, on average, spent 145 days (range: 137 – 157) and showed high site fidelity across years. While at the non-breeding grounds in Central Botswana, Mozambique, Zimbabwe and South Africa, falcons spent an average of 95 days (range: 57 – 112) and returned to the same sites in consecutive years. Again, at the stop-over sites, the tagged falcons returned to the same stop-over sites in Manipur, showing high-site and regional fidelity. Given this, falcon populations stopping over in Manipur are likely different than that of Nagaland. Therefore, the need of tagging a lot more Amur Falcons from the region is required to understand better their migration, breeding and non-breeding grounds and stop-over sites.

Milestones

This project, along with the Nagaland Amur Falcon project, has helped in the understanding of the Amur falcons passing through Manipur and Northeast India, is critical for conservation planning and has helped in bringing the local communities together to adopt a landscape-level conservation approach for the Amur Falcons stopping over in the region

ASSESSMENT OF CLIMATE CHANGE IMPACTS ON SOIL HEALTH THROUGH MICROBIAL AND PLANT COMMUNITIES IN ALPINE ECOSYSTEMS OF INDIAN HIMALAYAN REGION

ONGOING PROJECT

Funding Source
UNDP NATCOM

Investigator
Dr Gautam Talukdar

Researcher
Pankaj Tiwari

Date of Initiation
January 2018

Proposed Date of Completion
June 2022

Objectives

The objective of the project is to (i) Assess soil health by investigating changes in soil organic carbon, soil CO_2 efflux, and soil microbial enzymatic activity with respect to climate change; (ii) Understand variations in soil nutrient composition under experimental warming with emphasis on C: N ratio; and (iii) Evaluate climate change impacts on microbial and plant diversity, community composition, plant biomass, and phenology.

Progress

During the reporting period, an experimental station in Bhojbasa, Gangotri National Park, at 4000 m, was established. Fifteen Hexagonal open-top chambers have been installed to simulate climate warming and understand the soil response to temperature rise. This will aid in the long-term monitoring of climate change impacts on soil microbes, plants, and related functional aspects. During the year 2020-21, soil and ecosystem respiration measurements from the experimental site and elevation gradients, taken during the growing season of 2019, were analyzed.

Outputs and Outcomes

Findings suggest that warming will stimulate plant growth in this region. High plant productivity will lead to increased ecosystem respiration setting a positive feedback to climate warming; however, it will be counter-balanced by increased carbon sequestration by plant photosynthesis. In the short term, soil respiration in this region is unaffected by warming, although an increased temperature sensitivity under warming, probably due to the increased contribution of root respiration, may give rise to higher CO_2 emissions in future. The results suggest that warming will not induce soil CO_2 emissions from this region in the short term and will act as a net carbon sink in the future. This study provides a baseline for predicting climate change impacts in the entire Himalayan Region. Since the baseline results have been established on soil nutrients, soil and ecosystem CO_2 efflux, microbial and plant diversity, microbial enzyme activity, and climatic parameters, such as atmospheric and soil temperature, soil moisture and relative humidity, extensive field research in the upcoming seasons can be conducted so as to attain a proper understanding of the warming impacts.

Milestones

A long-term study will provide insights into climate change impacts on alpine habitats of the Indian Himalayan Region and its role in global carbon cycling.

MITIGATION OF HUMAN-ELEPHANT CONFLICT IN AND AROUND RAJAJI TIGER RESERVE, WITH EMPHASIS ON MITIGATION STRATEGIES DURING KUMBH, 2021

ONGOING PROJECT

Funding Source
Uttarakhand Forest Department

Investigators: Dr Parag Nigam, Dr Samrat Mondol, Dr Bilal Habib, Dr N. Lakshminarayan, Dr Bivash Pandav

Researchers
Jayjit Das, Suvankar Biswas, Sreedhar Vijayakrishnan

Date of Initiation
March 2020

Proposed Date of Completion
June 2022

Objectives

Objectives of the project were as follows: (i) Investigating patterns of home range and movement of elephants in select locations within the landscape to serve as a precursor to understanding human-elephant conflict (HEC) holistically and Kumbh in particular; (ii) Landscape-level assessment (covering the entire Rajaji TR and Haridwar FD) of HEC and its

drivers to suggest implementable strategies to mitigate conflict; (iii) Intensive monitoring of HEC and carrying out socio-economic surveys in select conflict hotspots to assess; (iv) preparedness and willingness of local communities to participate in conflict mitigation; and (v) Evaluation of Animal Crossings through Newly Commissioned Wildlife Underpasses at the Chilla-Motichur and Kansrao-Barkot Corridors in the Rajaji Landscape, Uttarakhand.

Progress

Individuals with their collars intact (UKM2, UKM4, UKM17) and other identified elephants in the landscape were regularly tracked and monitored to understand the ranging behaviour of the elephants in the landscape. Detailed records of elephant movement were also collected from the forest department to corroborate the primary data. These data were analysed to understand the movement parameters such as space use, diel movement pattern, home range and movement behaviour of elephants before and after the installation of deterrents (Solar fences, trenches, etc.) in the region.

Incidents of crop damage and associated ancillary information on human-elephant conflict (HEC) were recorded from multiple zones across the study area to understand the nature and extent of crop damage caused by the elephants. Along with the primary data, secondary data from the landscape were collected from respective forest divisions in the study area. Low-hanging powerlines and transformers installed below a certain height (within reach of elephants) were also mapped within the elephants ranging areas. These points were mapped to assess the threat to the elephants in the area and avoid any untoward incidents of electrocution.

To conduct the socio-economic survey around the Rajaji Tiger Reserve and to cover the spatial extent, the area was divided into four zones. A sampling framework comprising all the 119 feasible villages located within the 5km buffer from the edge of the elephant habitat was developed. The first stage involved a rapid assessment of the study area in order to obtain overall information about the villages. Data on parameters such as demography, occupational pattern, distance from forest, religion, education status, past records of HEC and types of houses (cemented/non-cemented) were collected. Out of the 119 feasible villages, 60 villages were randomly selected using the “random selection” tool in QGIS. In the second stage, hierarchical cluster analysis was performed using Ward's method to identify relatively homogenous groups of villages. During the process, clusters were identified. From each cluster, more than 10 per cent of villages were selected randomly (using the “random selection tool” - QGIS). Subsequently, in the third state, 10% of the households from each of the villages were selected randomly for the survey. The questionnaire developed by Elephant Conservation Group and used in Myanmar was modified as per the context of HEC in the present study area. The survey was conducted from December 2021 to January 2022 in the selected villages after obtaining verbal consent from the respondents. Descriptive statistics were used to summarize the data.

As a part of Uttarakhand Forest Department (UKFD)-Wildlife Institute of India (WII) collaborative project on 'Mitigation of human-elephant conflict in and around Rajaji Tiger Reserve with emphasis on mitigation strategies during Kumbh, 2021', used by wildlife of the newly commissioned wildlife underpasses namely Motichur and Teen Pani on National Highway (NH) 72 in two of the identified wildlife corridors was assessed. Wildlife use of underpasses was quantified using photographic capture using remotely triggered camera traps that were set up for 94 days.

Outputs and Outcomes

A total of 34 bull elephants of varied age classes were documented, of which 21 bulls were observed to raid crops in the intensive monitoring area regularly. None of the crop raiding incidents on the western side of the Ganges was caused by female/mixed-sex groups. The detailed list of identified bull elephants and their photographic database was shared as a reference manual with the Haridwar FD prior to Kumbh 2021. Based on the analysis of the movement of elephants before and after the installation of deterrents such as a solar fence, active guarding, trenches, etc, it was observed that well-maintained and fully functional solar fences have been successful in deterring the elephants from crossing Anjani chaur, with a marginal effect of crop index serving as attractants for the elephants. The diel pattern of space-use based on the GPS fixes falling inside “habitat” and “human-use areas” during the non-musth crop raiding (NMCR) state suggests that elephants took refuge in the “habitat” classes (primarily comprising of trees and scrub) mostly during the daylight hours (6:00 AM to 8:00 PM) and mostly used “human-use areas” (crop-fields and built areas), from 8:00 PM to 6:00 AM. For all the GPS fixes pooled together (for UKM2, UKM4, UKM7 and UKM17), the average distance covered by the collared bulls from the edge of the western bank of the Ganges into the human-use areas was found to be 1058.22 (±794.6) m. Plotting the speed (mean ±

standard deviation) of the collared bulls at different hours suggested crepuscular behaviour with movement speed peaking during early morning and evening hours. Speed of movement is relatively less during daylight hours, 8:00 am to 7:00 pm. The annual home range (based on 100% MCP) of the collared bull UKM2 was 331 sq km, within the range (188 to 407 sq km) of the findings from previous telemetry studies in the landscape.

Secondary data collated and analyzed from the forest divisions in the study area showed a decline in the number of beats affected in the Haridwar, Dehradun and Lansdowne forest divisions in 2020 (with respect to earlier years – 2015 to 2019). The decrease in the number may be attributed to the preparedness of the forest department to manage HEC at the onset of Kumbh 2021. Crop damage was the most pertinent cause of HEC. Unlike in observations made from relatively fragmented, high-conflict areas, human death/injury in this landscape was not an acute problem. Based on secondary data, in Lansdowne Forest Division, most crop damage cases can be attributed to Rabi crops such as wheat. Most cases of crop damage in the Dehradun Forest Division were of paddy, while sugarcane was the most damaged crop in Haridwar Forest Division. Based on primary data, the most damaged crop in total (34.1%). During most of the crop-raiding incidents, villagers used a torch to drive away or deter crop-raiding elephants from their crop fields. Among villages facing HEC, a high percentage of farmers (72.5%) said that a lack of capital or funds was an obstacle they faced to improving their quality of life, while the availability of land was the major problem faced by the non-farmer respondents (89%). For farmers living in the elephant conflict area, 46.7% reported that elephants were a major problem, with an additional 26.6% reporting elephants as a minor problem. For non-farmers in these areas, 55.4% reported elephants were a minor problem, with another 21% indicating elephants posed a moderate problem.

Based on the camera trapping exercise carried out to understand the movement of wild animals along the newly constructed underpasses in Chilla-Motichur and Kansrao-Barkote corridors, a total of 1,468 images of eight wildlife species, 113 images of a feral dog, 2,429 images of domestic cattle, and 32,194 images of human were captured from a combined effort of 5,778 camera days. A total of eight wildlife species (leopard, elephant, sambar, nilgai, wild pig, chital, common langur, and porcupine) were captured at both the underpass structures. Wild pigs had the highest captures, followed by sambar and leopard. Not all the areas under the underpass structures were used uniformly by wildlife. Underpass with more trails was used more effectively. Wild animals avoided using the Motichur range office complex area. The photo captures of wild animals were higher at the underpass structures where there were no roads and weeds. The overall elephant capture was higher at the Motichur underpass. However, the capture rate was higher at the Teen Pani underpass. Both solitary males and female herds with calves have been captured while using the Motichur underpass; however, only solitary males used the Teen Pani underpass. The results of this study highlighted considerable anthropogenic activities at the underpass structures. Temporal avoidance of human activity was found by wildlife in both the underpass structures.

Milestones

The study demonstrates that the remnant patches of grasslands along the River Ganges along the Eastern Bank of the river from Bhimghoda barrage in Hardiwar to the inter-state boundary near River Kotawali are extensively used by elephants and other wildlife. These grasslands are under threat from a range of biotic pressures. Restoring grasslands can be a long-term conflict mitigation strategy as the fodder base for elephants can increase. Considering this, the remnant natural grasslands along Dasowala, Kotawali, Amichand, Anjani and Jhilmil Jheel can be brought under the ambit of Rajaji Tiger Reserve management. The extent of grasslands along the Eastern bank of the River Ganges from Haridwar to Kotawali is around 6.3 km^2.

Grassland recovery and protection can benefit other endangered species, like the swamp deer as well. One of the main revelations from the study is the elephant use of islets in the River Ganges. The islets in the Ganges provide habitats for elephants and other wildlife. Therefore, identifying islets that are frequently used by wildlife and including them in the ambit of Rajaji tiger reserve management would be important. Of the nine sites designated for Kumbh 2021, the sites Saptsarova 1 and 2, Sati Dweep and Naya Tapu can be considered with foolproof mitigation measures aimed at keeping elephants away from these patches. While the average distance moved in agricultural areas on the west Bank of the River Ganges in Haridwar was 1058m (±794.6), there are recorded distances that exceeded 4.5 km. These critical points need regular monitoring and maintenance.

TIGER RECOVERY STRATEGY AND LONG-TERM MONITORING IN SAHYADRI TIGER RESERVE, MAHARASHTRA

ONGOING PROJECT

Funding Source
Sahyadri Tiger Conservation Foundation,
Kolhapur National Tiger Conservation Authority, New Delhi

Investigator
Dr K. Ramesh

Researchers
Abhilasha Shrivastava and Shantanu Sharma

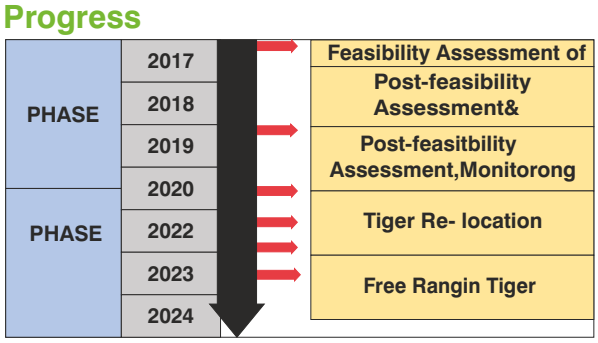
Date of Initiation
January 2017

Proposed Date of Completion
June 2022

Objectives

The objectives of the project are to (i) undertake feasibility study, habitat recovery and prey augmentation towards preparing the inviolate core area with adequate for tiger reinforcement, if needed; (ii) ensure demographically, genetically, and physically optimal population of tiger and its offspring by undertaking population management by strengthening existing connectivity options and consider translocation of tiger from other suitable sites if natural colonization is not absolutely possible; (iii) devise and execute monitoring strategy of founder individuals (prey species and tiger, if translocated) involving radio-telemetry and GPS-satellite/GSM tracking technology; (iv) study predator-prey relationship and undertake population estimation and monitoring as per NTCA Phase IV monitoring protocol; (v) undertake conservation education program for local people and capacity building training for field staff towards social acceptability and technical skill development respectively for effective implementation of tiger recovery program.

Progress



Outputs and Outcomes

Through the site suitability analysis considering four major habitat characteristics, the team estimated a total area of 451 km^2 as a potentially suitable area for the tiger. The prey availability estimates based on the line transect method were 9.5 km which is enough to support 12 tigers at the moment. The camera trap capture shows a high encounter as compared to the line transect. Therefore the team shifted to REM and used camera trap captures to estimate density. The cumulative ungulate density of 25.35 per sq km is shared by several carnivores and can potentially support 27 tigers. However, larger ungulate prey is not adequate and, thus, requires augmentation of prey such as Chital and Sambar

Milestones

The feasibility assessment has provided key information on the current status of habitat, prey and carnivore population and local support for the project. Further, the post-feasibility assessment and monitoring revealed that prey density is actually quite high than previously believed. A key finding was that due to constraints in the methods adopted (i.e., line transect), the prey density estimates were low due to lower detection rates given the rugged terrain of Sahyadri. When the research team substituted the line transect data with camera trap captures using the random encounter modelling (REM) framework, the resultant prey density estimates were quite high (please refer to chapter III of Part B). Another key finding was the improvement in management effectiveness which is reflected in the MEE reports (MEE 2011; 2014; 2018) and the internal MEE 2021. The initial impression of Sahyadri having a low prey base and overall low potential for holding tiger populations has been proven inaccurate after the five-year survey period.

THE ASSESSMENT OF IMPACTS OF THE PROPOSED NAGPUR - MUMBAI SUPER COMMUNICATION EXPRESSWAY, MAHARASHTRA, SAMRUDDHI CORRIDOR ON WILDLIFE VALUES AND MEASURES RECOMMENDED TO MITIGATE NEGATIVE IMPACTS

ONGOING PROJECT

Funding Source
Maharashtra State Road Development Corporation

Investigators
Dr Bilal Habib, Dr Gautam Talukdar, Dr Abhijit Das and Dr Navendu Page

Subject Matter Specialist
Dr S.P. Goyal

Project Scientists
Dr Indranil Mondal
Dr Shivam Shrotriya

Date of Initiation
July 2018

Researchers
Prasad Tonde, Deb Shankha Goswami, Venkanna Babu Guthula, Pallavi Ghaskadbi and Zehidul Hussain

Proposed Date of Completion
July 2022

Objectives

The objectives of the project were to (i) identify areas of conservation importance in terms of connectivity, important wildlife habitats, and important natural features; (ii) evaluate habitat, characteristics, species diversity, population and conservation status, and habitat use by key wild animal species near the proposed alignment; (iii) based on the observations above suggest location, type, size, and number of the mitigation measures across the alignment of the roads for ensuring permeability in the context of identified key wild animal species; (iv) provide technical guidance during construction and implementation of mitigation measures; (v) assist in monitoring the effectiveness of the mitigation measures during the operation phase; and (vi) suggest measures for achieving carbon-neutral goals.

Progress

The Nagpur-Mumbai Super Communication Expressway (NMSCE) was categorized into three ecogeography zones, *viz*., Vidarbha, Aurangabad Highlands, and Northern Western Ghats. A field survey-based assessment of the habitat and its wildlife use was followed after the literature reviews and reconnaissance survey. Data gathered during the field survey and reviewed literature informed about potential wildlife habitats like forest patches, wetlands, grasslands, and their movement corridors. The data helped in planning relevant mitigation measures for all faunal taxa before the road was constructed. Mitigation measures included the construction of several new wildlife overpasses and underpasses and modifications of otherwise planned structures to prevent and minimise negative impacts on wildlife and associated habitats.

The study was designed separately for different taxonomic groups: (i) *Avifauna survey:* A field survey was carried out to collect data on avifaunal diversity along the expressway. Field protocol was designed in the point count distance sampling framework for this survey. The survey was carried out within a 2km buffer area alongside the expressway. Since Birds can move and migrate over a large area, the buffer area was kept minimum to measure immediate impacts on the expressway without compromising on diversity data. Point counts were conducted along a perpendicular angle to the expressway at a distance of 250m from each point to follow a gradient of the diversity and abundance change away from the road. This provides crucial data to help mitigate bird-vehicle collisions. The survey was carried out early in the morning after sunrise. The evening surveys were carried out when the survey team came across any suitable habitats for nocturnal species.

(ii) *Herpetofauna survey:* The research team employed 161 time-constrained Visual Encounter Survey (VES) to determine the species list and abundances of amphibians and reptiles. The team performed at least one diurnal and one nocturnal VES at every 10 km of stretch. The team also performed 47-night driving surveys covering around 500 km on parallel highways and service roads to target actively moving nocturnal amphibians and reptiles. The research team also recorded opportunistic sightings of mammalian fauna encountered along the Nagpur - Mumbai Super Communication Expressway. Construction of the road and mitigation measures is in the final phase, and post-construction monitoring is planned at the wildlife mitigation structures such as overpasses, underpasses and viaducts. Several structures were visited to verify dimensions and landscaping work for wildlife connectivity.

Outputs and Outcomes

During the detailed field survey in the buffer area, the team conducted 1,585 point counts covering the entire 701km length of the expressway. The team documented 224 species of Birds along the Samruddhi expressway. The diversity of species differed across contrasting habitats as the expressway passed through varying terrain and topography. The highest diversity was observed in wetlands and agricultural fields adjoining the road, whereas arid dry hilly areas exhibited poor diversity. It is evident from the data that the buffer area of the expressway harbours approximately 40% of the total bird species in the state. Four species of aves exhibiting endemism were also observed.

Table 1. Conservation status, migratory behaviour and endemism of the bird species observed along the Nagpur-Mumbai Samruddhi Expressway.

IUCN Status	No. of Species	IWPA Status	No. of Species
Endangered	1	Schedule I	19
Vulnerable	4	Schedule IV	203
Near Threatened	5	Schedule V	2
Migratory Status	No. of Species	Endemism	No. of Species
Resident	161	Non-Endemic	217
Local Migrant	19	Endemic to India	7
Long-Distance Migrant	44	-	-

During the field survey, 36 species of amphibians and reptiles were encountered along the stretch of the Nagpur-Mumbai Super Communication Expressway. Among the 36 species, 11 species of amphibians belong to four families and nine genera, and 25 species of reptiles belonging to 10 families and 20 genera. Among the amphibians, Dicroglossidae was the dominant family. Among the 25 species of reptiles, 14 species of lizards and 11 species of snakes were encountered. Among the lizards, *Gekkonidae* represented the dominant family (5 species), followed by the *Agamidae* (4 species) family of lizards.

Among snakes, *Colubridae* was the dominant (5 species). Among the amphibians, the Indian skittering frog *Euphlyctis* sp. was the commonest, followed by cricket frogs. The research team encountered Common Krait, Common Indian Bronzeback, and Indian Rat Snake only once. The team did not encounter any live Indian Spectacled Cobra and Russell 's viper, but found road kills of these species near the construction sites.

Mammalian species were also encountered and observed nearby or on the expressway. Nilgai, *Boselaphus tragocamelus* was the most commonly encountered in herds of six or more individuals, followed by Blackbuck, *Antilope cervicapra* and Jungle cat, *Felis chaus*. Signs of large carnivores like Leopard, *Panthera pardus fusca* and, striped hyena, *Hyaena hyaena* were rarely observed.

A total of 1,797 crossing structures are planned across Nagpur-Mumbai Super Communication Expressway (NMSCE) from Nagpur to Mumbai. The crossing structures include nine overpasses and 42 underpasses specifically built as wildlife crossing structures. Several other structures were modified to increase their use as additional wildlife crossing structures. The research team visited several wildlife structures to verify and document the progress.

Milestones

Point count data was used to document the avifauna diversity along the Samruddhi expressway. A database of 224 field-verified Birds present in the landscape was generated, including a number of

threatened species. The visual encounter survey and night driving data provide baseline information about amphibians and reptiles along the road. A total of 36 herpetofauna species were recorded in the exploratory survey, which is likely to increase with the advent of monsoon. Monitoring and assessment of the suggested wildlife mitigation measure structures on Samruddhi Expressway were initiated during the construction phase.

Picture. A wildlife overpass of 60-meter width and 120-meter width is under construction.

ASSESSMENT OF SPATIAL AND TEMPORAL OCCUPANCY OF TIGER AND ELEPHANT IN RELATION TO HABITAT CHARACTERISTICS AND ANTHROPOGENIC FACTORS FOR THE CREATION OF ECO-SENSITIVE AREAS IN SAWANTWADI AND DODAMARG TALUKAS OF SINDHUDURG DISTRICT IN WESTERN GHATS OF MAHARASHTRA, INDIA

ONGOING PROJECT

Funding Source
Maharashtra Forest Department, Govt of Maharashtra

Investigators
Dr Bilal Habib and Dr S.P. Goyal

Researchers
Dr Rahul De, Dr Vinay Kumar and Dr Rohit Chaudhary

Date of Initiation
December 2020

Proposed Date of Completion
July 2022

Objectives

The objectives of this project are to (i) assess spatial and temporal variation in occupancy of tiger, elephant, and other wildlife species in relation to habitat characteristics and anthropogenic factors, (ii) assess the functionality of the corridor of villages of Sawantwadi and Dodamarg talukas of Sindhudurg district for linking Sahyadri landscape in the northern

with the central Western Ghats based on genetic approaches, and (iii) identify and delineate areas if needed for the creation of Eco-sensitive Area for retaining the functionality of the corridor between northern and central Western Ghats.

Progress

From April 2021-March 2022, the research team deployed camera traps (n=323; 100 during summer and 223 during winter) across a total of 69 villages. Each camera trap was deployed for 25 to 34 days and was operational continuously. The total camera trapping effort resulted in 9281 trap nights. In addition, the team carried out 500m sign surveys (n=226) for indirect evidence (faecal samples, carnivore pug marks, herbivore footprints, antler rub marks etc.) of animal presence. To characterize the vegetation across the study area, the team sampled plots (n=675) at the start and end points of the sign surveys as well as the camera trap locations. The team administered a questionnaire survey across 143 respondents to understand the local residents' perceptions of wildlife, patterns of human-wildlife conflict and population stochasticity.

Outputs and Outcomes

The camera trapping exercise resulted in the capture of 21 mammalian species along with galliform avifauna (Indian peafowl and grey junglefowl) during the fieldwork period. Photo-captured carnivore species included tiger, leopard, wild dog, sloth bear, palm civet, small Indian civet, ruddy mongoose, common grey mongoose, stripe-necked mongoose, rusty-spotted cat and pangolin. In comparison, herbivore species included gaur, sambar, mouse deer, wild pig, barking deer, four-horned antelope, grey langur, bonnet macaque, Indian crested porcupine and Indian hare. Among herbivores, RAI ranged between 0.11 and 10.01. RAI of low-occurrence species such as barking deer, bonnet macaque and four-horned antelope ranged between 0.11 to 0.66. Among carnivore species, RAI varied between 0.11 and 1.76. A total of 566 indirect animal signs were collected along with their geolocations in addition to the 288 faecal samples collected across both seasons. Amongst the indirect signs, ungulate hoof marks (n=155) and porcupine digging (n=114) were the highest. The highest number of faecal samples collected were of sambar (n=138), followed by large carnivores (tiger/leopard; n=58).

Milestones

The current project successfully inventoried the mammalian species diversity in the Dodamarg-Sawantwadi landscape in Sindhudurg district, Maharashtra. The research team also computed relative abundance indices for the mammalian fauna and provided fine-scale and village-wise estimates of relative abundance and species diversity. The team identified the elephant conflict hotspots during the last five years.

ONGOING PROJECT

ESTIMATION OF ECONOMIC LOSSES IN REAL TERM PER HECTARE BASIS DUE TO FOREST FIRE IN UTTARAKHAND AND MADHYA PRADESH

Funding Source
Ministry of Environment, Forest and Climate Change, New Delhi through ICFRE, Dehradun

Investigators
Dr B.S. Adhikari and Dr S. Lyngdoh

Researchers
Debaleena Chatterjee and Babu Saddam

Date of Initiation
April 2020

Proposed Date of Completion
August 2022

Objectives

The project's objective is to assess the economic loss of faunal diversity due to forest fires on a per-hectare basis.

Progress

Forest fire has been an integral part of the forest environment and has played a vital role in faunal disturbance. However, forest fire plays an important role in shaping forest ecosystems, their conservation and management. Although fire has benefits in clearing the forest floor and paving the way for the regeneration of new grass, herbs and saplings, these are marginal compared to the huge losses linked to it. As a preliminary approach, the research team tried to compute the minimum losses caused due to forest fire in Binsar and Nandhaur Wildlife Sanctuaries in Uttarakhand and Ratapani and Nauradehi Wildlife Sanctuaries in Madhya Pradesh. All these sites harbour various endangered and magnificent species of animals and birds. For the dynamic approach, the team aimed to produce independent, time-sliced, spatial predictions of suitable habitats for the entire target species, mammals and birds.

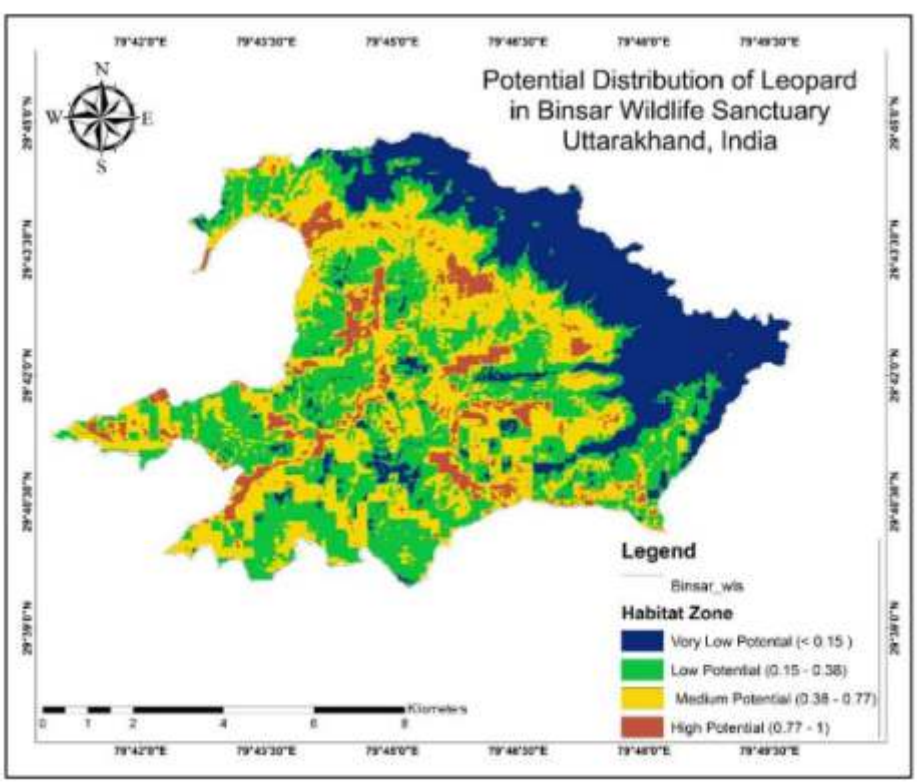
The GPS locations were obtained from the field by implying different field techniques from the protected areas. Models initially included up to thirty spatial predictor variables that previous research has suggested could potentially drive changes in habitat suitability for the species. The research team used Species Distribution Modelling to investigate and quantify geographic range sizes and the nature of suitable habitats over successive years in response to annual fire occurrences. The team compared the area lost to species in both pre and post-fire scenarios from the habitat suitability designs of SDM. To predict the habitat loss due to forest fire, the team utilized MODIS fire scars 2019 based on fire intensity, i.e. Moderate and Low fire intensity and produced habitat loss maps. A density estimation approach was applied to calculate an approximate number of species that might have been affected due to forest fires.

Outputs and Outcomes

With a dynamic approach, independent, time-sliced, spatial predictions of suitable habitats were produced for targeted species of mammals and birds from Protected Areas of Uttarakhand and Madhya Pradesh. Species Distribution Modelling was used to quantify geographic range sizes and the nature of suitable habitats over successive years in response to annual fire occurrences. A density estimation approach was applied to calculate an approximate number of species that might have been affected due to forest fire, and economic loss was calculated.

Milestones

This pilot investigation seeks to estimate the financial damage that a forest fire will cause to wildlife with respect to low, moderate, and high severity classes. This research work will eventually open the door for even precise financial evaluation studies that take into account wildlife that is affected by any disaster or cause, regardless of whether it occurs inside or outside of protected and non-protected areas.



ONGOING PROJECT

PROTECTING AND INVESTING IN NATURAL CAPITAL IN ASIA AND THE PACIFIC UNDER THE KNOWLEDGE AND SUPPORT TECHNICAL ASSISTANCE (KSTA) - 9461

Funding Source
Asian Development Bank (ADB)

Investigators
Dr Bilal Habib and Dr Malvika Onial

Researcher
Sharmistha Singh

Date of Initiation
January 2019

Proposed Date of Completion
August 2022

Objectives

The project has the following objectives (i) Highlight the many benefits of green infrastructure to a human society based on the principles that protect and enhance nature and natural processes; (ii) Integrate principles of green growth and concepts of smart planning into the planning of linear developments in identified sectors; (iii) Optimizing the use of natural capital for the sustainability of natural resources; achieving greater acceptability of development goals in harmony with the natural environment and enhancing the quality of life of people; (iv) Build capacity of stakeholders in the transportation sector through *inter alia* through training, information sharing and highlighting best practices in the field of green linear infrastructure.

Progress

A series of online seminars (webinars) was organized on green linear infrastructure geared towards building the capacity of stakeholders in the transportation sector. One-long duration e-Learning Audio-VisualProduct (AVP) was produced for planning and implementing smart green road and rail transportation projects. Four short-duration e-Learning video clips were produced for planning and implementingsmart green road and rail transportation projects. Five short video clips on key project components were produced for online and social media platforms.

Outputs and Outcomes

The WII-ADB Greening Transportation Projects webinar series was initiated from November 2021 to February 2022 to address capacity needs for conserving and managing natural capital during the planning and implementation of transportation projects in Asia. The webinar series aimed to broaden and deepen the understanding of issues related to protecting natural capital and investing in green linear infrastructure. It fostered a global dialogue with leading experts from the field of green linear infrastructure for integrating principles of green growth, and concepts of smart planning, into designing and planning linear infrastructure developments.

To achieve the objectives, the scope of the webinar series followed these thematic sessions: (i) Why does connectivity matter and how to develop models of connectivity for different species? (ii) Ecological considerations in planning and mitigation measures and capacity building need for effective conservation alongside linear infrastructure. (iii) Natural capital conservation amidst development and the role of governance in planning conservation-friendly and sustainable transportation projects. (iv) Lessons from the field: Success stories of mitigation measures in maintaining and enhancing connectivity and concluding session: summing up the webinar series with key takeaways.

The webinar series brought together 200 representatives from 33 countries from sectoral development agencies for roads and, highways, railways, as well as from development banks and environmental organizations from around the world, including ADB's developing member countries (DMCs) such as Bangladesh, Bhutan, Cambodia, India, Indonesia, the Lao People's Democratic Republic, Nepal, the Philippines, Tajikistan, and Thailand. The well-attended series provided an opportunity to build and enhance the capacities of individuals and organizations implementing green linear infrastructure projects in the transport sector.

The production of 10 Audio Visual Products (AVPs) is currently underway. It includes an AVP with all forms of digital media like 2D, and 3D animation, infographics, on-site videography, stop-gap motion and interviews. This is being used to make a stimulating film-highly immersive in nature for the audience to understand the challenges of building infrastructure and the need to make this wildlife friendly through various mitigation measures. A series of four short e-learning videos to be featured online and packaged for use across social media channels and other online platforms to showcase the key components of the Project.

Milestones

A four-part WII-ADB Greening Transportation Projects webinar series was initiated from November 2021 to February 2022 to address capacity needs for conserving and managing natural capital during the planning and implementation of transportation projects in Asia.

The production of 10 audio-visual products (AVPs) in 2022. This included a long-term AVP called Bridging Futures, which is about developing smart green infrastructure across sensitive wildlife habitats in India. The documentary explains various issues that arise due to linear infrastructures and suggests how these can be mitigated.

A series of four short e-learning films were also produced to showcase the key components of the project. All the long and short films have their respective five promos.

UNDERSTANDING THE IMPACTS OF MINING AREAS OF WESTERN COALFIELDS LIMITED (WCL) AND CHANDRAPUR THERMAL POWERPLANT (CSTPS)

ONGOING PROJECT

Funding Source
Western Coalfields Ltd (WCL) and Maharashtra State Power Generation Company Ltd. (MAHAGENCO)

Investigator
Dr Bilal Habib

Researchers
Saumyata Srivastava, Anees Khan, Sougata Sadhukhan, Keerthi Sudarsan and Akanksha Saxena

Date of Initiation
November 2020

Proposed Date of Completion
November 2022

Objectives

The objectives of the project are to (i) evaluate the pattern in the land use and land cover change in and around mining areas of Western Coalfields Limited and Chandrapur Thermal Power Plant; (ii) assess faunal diversity in and around the mining areas of Western Coalfields Limited and Chandrapur Thermal Power Plant; (iii) explore the issues related to habitat fragmentation, loss of structural and functional corridors due to ongoing and proposed mining areas of the Western Coalfields Limited and Chandrapur Thermal Power Plant; (iv) evaluate the issues of human-wildlife conflict concerning mining areas of Western Coalfields Limited and Chandrapur Thermal Power Plant; (v) evaluate the effects of dust deposits on plants concerning mining areas of Western Coalfields Limited and Chandrapur Thermal Power Plant; (vi) Soundscape ecology- Study of the acoustics relationship between living organisms, humans, and their environment to evaluate the effects of mining (Vibrations and Noise) on different wildlife species. Evaluate changes in forest sound concerning mining areas; (vii) Identify areas of connectivity concerning power transmission lines and suggest mitigation measures to reduce the electrocution of animals; and (viii) develop a management plan for the conservation of wildlife around mining areas and coalfields of Western Coalfields Limited and Chandrapur Thermal Power Plant.

Progress

Satellite imagery and Geographic Information System (GIS) based evaluation of land use and land cover

change in and around the mining areas of WCL and CSTPS across the years 1999 and 2021 was carried out using the ground-validated data acquired from different areas of mines. Fieldwork was conducted to assess faunal diversity in and around mining areas of WCL and CSTPS. Avifaunal diversity was recorded using point counts along with vegetation plots at the same point count stations, and camera trapping was carried out in the buffer of WCL mines and CSTPS. A herpetological survey and point count for amphibian and reptile diversity were carried out. GIS-based assessment of forest fragmentation and extent of linear infrastructure for 1999, 2014 and 2020 was carried out in Chandrapur district, including the mining clusters of WCL and the CSTPS.

Outputs and Outcomes

"Landuse-Land cover changes in and around mining areas of Western Coalfields Limited and Chandrapur Super Thermal Power Station (1999 – 2021)" report was submitted to the Chief Engineer of CSTPS and General Manager (Environment) WCL.

Milestones

A LULC analysis spanning 1999-2021 was carried out considering the ecological importance of the study landscape comprising TATR and nearby forests, and the rapid spread of mining infrastructure in the area. The change analysis was conducted at three spatial scales – mine, mine cluster and district level.

The methods included a combination of GIS and Google Earth Engine (GEE) based classification of high-resolution satellite imagery of the study area. Different types of land use within the mines (viz., overburden dump, revegetated area etc) were verified on field. Additionally different combinations of spectral bands of satellite imagery were used to represent different water and vegetation indices.

The analysis revealed temporal and spatial patterns in growth of mining infrastructure in the region. Using slope profile and LULC analysis, we were able to demonstrate the need for rehabilitating the topography of mine and overburden prior to revegetation to ease animal movement in closed and reclaimed mines.

Key findings included the conversion of agricultural land into mining, and increase in human settlement post establishment of mines, which could be a cause of increasing conflict in the region, as most mines are in the vicinity of forests.

BASIC STUDY DESIGN OF BIODIVERSITY ASSESSMENT FOR HIMACHAL PRADESH

ONGOING PROJECT

Funding Source
JICA Assisted Project IHPFEM & L

Investigators
Dr Salvador Lyngdoh, Dr Monali Sen, Dr B S Adhikari, Dr J A Johnson, Dr V P Uniyal, Dr Abhijit Das, Dr S P Goyal, Dr S Sathyakumar

Researchers
Urjit Bhatt, Nidhi Singh,Himani Karki, Meghma Ghosh,Amar Paul Singh, Saurav Chaudhary, Tushar Parab and Priyanka Sharma

Date of Initiation
January 2021

Proposed Date of Completion
January 2023

Objectives

The objectives of the project are to (i) undertake a detailed assessment of the state's biodiversity in select areas to improve scientific conservation and management of biodiversity; (ii) do threat assessment and ranking for the biodiversity (both flora and fauna); and (iii) develop biodiversity assessment design/methodology for HP through establishing baseline and monitoring indicator for long-term monitoring.

Progress

The sampling was conducted in four Protected Areas (PAs): Simbalbara National Park (SNP), Pin Valley National Park (PVNP), Chandratal WLS (CWLS), and Churdhar WLS (ChWLS). Camera trapping and line transect methods were employed to determine the diversity of mammalian fauna of the three PAs (PVNP, CWLS, and ChWLS). All the landscapes were divided into 1x1 km grids. Bird census was conducted early morning, 30 minutes after sunrise and 10.00 hr. 60-point count stations were laid along six transects (1000 m each), each separated by at least 100 m across both habitat types, i.e., streamlined and deciduous. Because there isn't enough information regarding Birds in this area, the research team focused on all bird species (residents, passage migrants and long-distance migrants). All Birds were observed visually within a 40m radius of each station. Most of the species were photographed and counted to determine abundance.

Ten 10x10m plots were randomly established at the hill base, slope, and top for vegetation analysis at each site for ChWLS. Within each plot, trees, saplings, and seedlings were analysed in 10x10 m quadrats, shrubs in 5x5 m quadrats, and herbs in 1x1 m quadrats. For PVNP, we conducted a semi-structured questionnaire survey of 30% of households in each village, focusing on primary resources and their uses. The respondents were chosen and interviewed at random. Because trees and shrubs were not found in CWLS, twenty-five 1x1m plots were randomly established within and outside PA at each site for vegetation (herbs) analysis. The Provenance Value (PV) index for herbs was calculated by adding the relative frequency and relative density values.

Fish were sampled using various traditional methods, such as setting up fish traps, gill nets, cast nets, and drag netting methods, with a minimum distance of 150m between two sampling sites. Fish species were either identified on the spot or systematically preserved for further identification. A weekly fish market survey was also carried out.

Six 1,000m long belt transects were laid in three forest habitats (dry deciduous, streamline moist, roadside disturbed), and one transect of each habitat was walked at three different time zones per day, except rainy days, to study butterflies. Three-time slots per day were used to understand the Lepidoptera species diversity: 0800-1100 Hours, 1200-1500 Hours and 1600-1900 Hours. Species

were observed in all three habitat types using the direct sampling method. The diversity of Odonates was studied in two distinct habitats: Streamlined moist forest habitat (flowing water) and Artificial water holes (man-made water resources for animals, stagnant water). Scarabaeidae beetles were observed with the help of hand-sorting methods, and the presence of the spies was determined using cattle and elephant dung. For the species abundance analysis, species were photographed, and the number of individuals was counted. Sweep netting was used to capture necessary samples, which were then released after examination.

Different stream patches were identified as the key locations for the amphibian survey. Following site selection, Visual Encounter Surveys (VES) (Time constrained) were conducted at regular intervals. The SNP was surveyed based on 11 VES sites and six habitat types. Belt transects were also walked. Pool sampling and stream sampling (VES) was conducted for amphibians in ChWLS to understand the habitat and population estimation of Nanorana vicina. Opportunistic encounters with reptiles were also carried out. A checklist of the herpetofauna was prepared for all four PAs.

Outputs and Outcomes

The study confirmed the presence of various species from the four PAs: (i) SNP - 20 species (n=1,851, trap nights=887), (ii) CWLS - 6 species (n=85, trap night = 529), (iii) PVNP - 6 species (n=289, trap nights=1,394), (iv) ChWLS - 12 species (n=834, trap nights=1804), were photo-captured through camera-trapping. The density was calculated for all the species via the camera-trap distance sampling method.

Vulpes in CWLS and PVNP with a value of 0.7 individuals/km^2 and 0.4 individuals/km^2, respectively. In ChWLS highest ungulate density was for *Muntiacus muntjac*, with 2.5 individuals/km^2. A total of 158 species belonging to 42 families were reported. A total of 245 species were recorded from ChWLS, of which 15.1% were trees, 21.2% were shrubs, 54.7% were herbs, 4.1% were climbers, and 4.9% were ferns. The total vegetation indicated that the maximum herb species were present, followed by shrubs, herbs, ferns and climbers. Rosaceae was the richest family having the highest (n=21) individuals, followed by *Asteraceae* (n=16) and *Poaceae* (n=15). In PVNP, livestock is an integral part of farming as these not only substantiated the sources of livelihood but also ensured long-term maintenance of soil fertility through the addition of farmyard manure and by providing draught force for farming and transport. A total of 62 species were recorded from CWLS. *Asteraceae* was the richest family having the highest number of individuals (n=11).

Thirteen sampling sites were selected in and around SNP, and 13 fish species belonging to 8 families were recorded in winter. *Cyprinidae* was the most dominant family, followed by *Danionidae*. Fourteen sampling sites were chosen in and around CWLS, and no fish species were recorded. Eighty-one species of butterflies were reported to belong to 6 families. Twenty-two species of odonates comprising 12 species of *Zygoptera* (damselflies) and ten species of *Anisoptera* (dragonflies) belonging to 7 families were reported during the study. In Scarabaeidae fauna, elephant and cattle dung were observed, but there was no such significant difference.

The survey yielded 29 herpetofauna species in SNP. For reptiles and amphibians, the most dominant families were *Colubridae* (n=4) and *Dicroglossidae* (n=6), respectively. The research team encountered 20 reptile species from 17 genera and ten families and nine amphibian species from 8 genera and three families. The team found 21 herpetofauna species via VES and 16 species during opportunistic sampling. Only two species were found in PVNP, and no herpetofauna was reported from CWLS

Milestones

The baseline data for various species at a landscape level will be provided. Protocols for biodiversity conservation as well as long-term ecosystem and social monitoring, will be developed. Site-specific models/patterns and information on human-wildlife conflict/ RET/ invasive species will be provided. At least one workshop will be held at each major site. Finally, a project report will be produced with specifics of maps, files and relevant information to various site-specific needs.

ONGOING PROJECT

HIMALAYAN ALPINE BIODIVERSITY CHARACTERIZATION AND INFORMATION SYSTEM-NETWORK

Funding Source
National Mission on Himalayan Studies (NMHS)

Investigators
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Dr G.S. Rawat

Researcher
Aimon Bushra

Date of Initiation
February 2020

Proposed Date of Completion
February 2023

Objectives

The objective of the project is to (i) characterize the spatial extent and patterns of alpine plant communities in Ladakh using multi-scale satellite data; (ii) assess alpine vegetation composition and diversity following a unified systematic and multistage sampling protocol; (iii) determine EO-based environmental proxies of alpine biodiversity and ecosystem dynamics; and (iv) develop predictive models for multi-scale prediction of alpine plant diversity patterns linking environmental proxies and habitat variables.

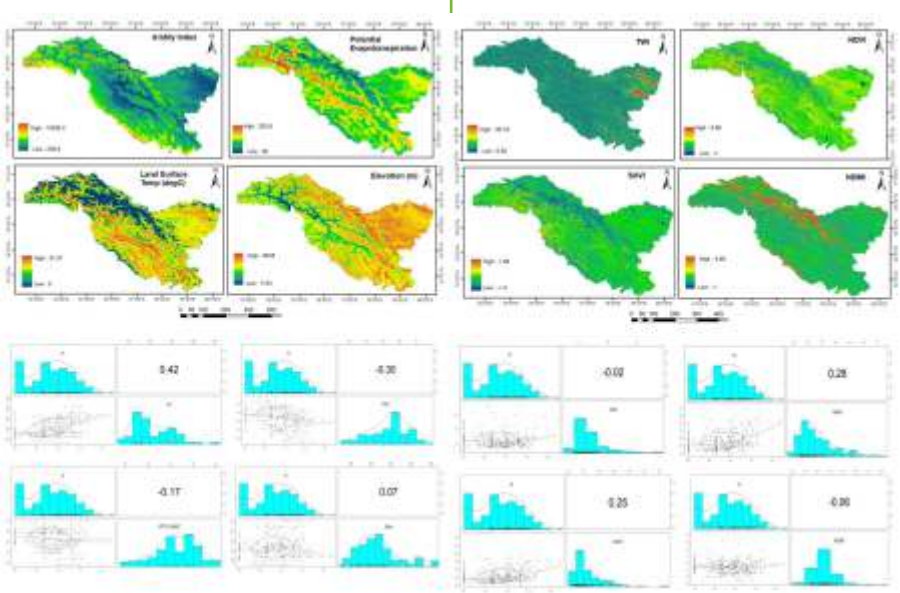
Progress

During the reporting period, the research team completed fieldwork during the vegetation growing season of the year 2021, covering a vast range of landscapes from west to east Ladakh. The team surveyed a total of 30 grids (3x3 km) and collected geotagged data, photographs and soil samples in 150 (2x2 m) plots within these grids using the ODK mobile app. The Project Fellow attended a ten-day training workshop for data analysis at IIRS. The e-data forms submission on the IIRS server was completed.

Data entry in excel sheets and species identification of the 2021 survey were done. The soil analysis (OC, Na, K, N, pH) for a total of 83 soil samples from two different depths (0-10cm and 10-20cm) was also done. Field sampling for the second season (2022) has been completed. A total of 190 plots (2x2 m) were laid.

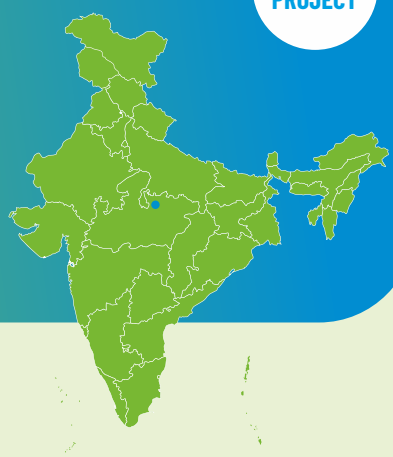
Outputs and Outcomes

A total of 338 plant species were observed in 150 (2x2 m) plots of the first season. The pH results for all 83 samples were obtained. The pH values ranged from 1.0 to 8.85. For Organic carbon (OC), results were obtained for 79 samples. The OC values ranged from 0.01 to 3.90. The results for Nitrogen content were obtained for 78 samples. The values ranged from 0.002 to 3.06. For Sodium content, results for 80 samples were obtained, and the values ranged from 1.2 to 70.92. For Potassium, results for 79 samples were obtained, and the values ranged from 15.81 to 119.93. pH, OC, Nitrogen, and Sodium analysis has been carried out for approximately 80 samples.



DEVELOPMENT OF LANDSCAPE MANAGEMENT PLAN AND MONITORING WITH REFERENCE TO THE KEN-BETWA RIVER LINK PROJECT IN PANNA TIGER RESERVE, MADHYA PRADESH

ONGOING PROJECT



Funding Source
National Water Development Agency

Investigators
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Researchers
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Date of Initiation
April 2018

Proposed Date of Completion
March 2023

Objectives

The objectives of the projects are to (i) enable the betterment of habitat, protection, and management for flagship species, *viz.* tiger, vultures, and gharial in the landscape; (ii) consolidate the landscape for overall biodiversity conservation through spatial prioritisation and well-being of forest-dependent communities; (iii) provide species-specific and site-specific monitoring strategies under the integrated landscape management context with a feedback loop and adaptive management options.

Progress

During the fourth year of the project, field data collection, analyses and writing were completed for the plan. An adult male tiger (P243) was radio-collared. Twenty-two vultures were tagged, and utilization density was estimated for vultures from the telemetry data of the three earlier tagged vultures. Surveys of *Gaushalas* in the landscape and Population Viability Analyses for vultures were also done. Villages where forest resource-based cooperatives may be established were identified for the landscape. Bringing information from the field, spatial prioritization and connectivity modelling, an overall map depicting all the areas proposed for habitat consolidation was prepared. Field verification of important habitats (satellite core, stepping stones, corridors, intersection points, riparian habitat and other conservation priority areas) was carried out.

Based on existing knowledge, the data collected, analysis results, recommendations, and prescriptions for each thematic component were formulated. All the maps were also clipped with the district, forest division and protected area boundaries, and detailed recommendations were given for each of these administrative units.A series of consultation meetings/writing workshops were organized with experts/resource persons in November 2021 to plug data and analyses gaps and seek inputs on plan writing. Furthermore, a series of consultation meetings were also organized with district administrations and other line agencies, including the forest department, in hybrid mode (some team members present physically, others joining virtually) starting from Panna District administration on 15 December 2021, followed by Damoh District administration on 17 December 2021 and Chhatarpur District administration on 17 January 2022.

Outputs and Outcomes

Tiger, co-predator & prey: In the buffer zone of Panna Tiger Reserve (PTR), among the carnivores captured in camera traps, the hyena was detected most frequently (0.11). Amongst prey species, livestock was the most frequent (1.27). Occupancy analysis of tigers and co-predators revealed that only ~11% (= 0.105) of the sampling area was occupied by tigers. However, leopards and hyenas were found to be widely occupying the buffer zone

with an overall high detection probability. Sloth bear occupancy was also high in the buffer zone. Occupancy estimates of the wolf, which is predominantly found in the buffer zone, indicated that wolves occupied a small proportion of the sampled area but with comparatively high detection probability.

Thematic map of prey species encounters rate revealed that wild ungulates are distributed widely in the core zone. The encounter rate of wild ungulates is low, except for some small patches in Madla, Hinouta, and Panna Ranges. Livestock was majorly encountered in Chandranagar core. However, major prey species of tigers, such as chital and sambar, were encountered in all four ranges of the core. Apart from the major prey species, nilgai was also encountered in most parts of the core area. The encounter rate of wild ungulates was low in the buffer zone. Livestock was majorly encountered in the Kishangarh buffer. Among the major prey species of tiger, chital was encountered mostly in the northern part of the Panna buffer and Kishangarh buffer. Sambar was found to be consistently low in the buffer zone and mainly found in the northern Kishangarh, Madiyadoh and Panna buffers.

Vulture: The radiotelemetry study of 25 tagged vultures revealed that resident vultures range widely, going even beyond the landscape boundaries, some going as far as Kuno-Palpur Wildlife Sanctuary in Rajasthan. Among the migratory vultures, Eurasian Griffons have gone to Pakistan, and the flight is still continuing, whilst the Himalayan Griffons have travelled to Nepal and China, crossing over Mt. Everest. Indian vulture was recorded to have covered

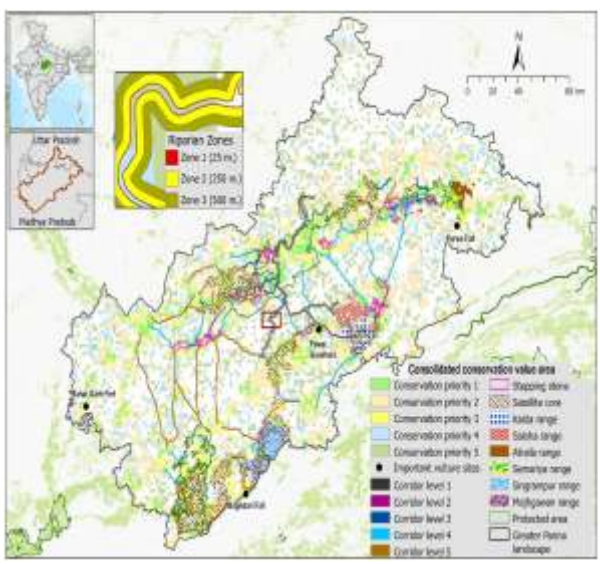


Figure. Map showing all the areas to be protected and restored (satellite cores, stepping stones, corridors, proposed conservation reserve, priority sites for biodiversity conservation) within GPL.

a cumulative distance of around 12,000 km with an average distance of 41.60km per day, whereas both the Red-headed vultures covered twice the distances of the Indian vulture. However, the Indian vulture mostly kept its movement confined within PTR and occasionally moved around PTR in Chhatarpur and North Panna Forest Divisions. On the other hand, both the Red-headed vultures showed significant movement outside PTR, travelling up to 159km. The first tagged Red-headed vulture has covered Chhatarpur, South and North Panna and Satna Forest Divisions, even moving outside the landscape. The second tagged Red-headed vulture showed variable movement throughout the landscape and beyond. Although these two birds (Red-headed vultures) are closer to the adult stage in their growth phase, the wide-ranging behaviour offers the species wider choices of resources in the landscape. It makes the population count and management challenging.

Crocodile: The aerial survey using high-resolution UAV across PTR and Ken Gharial Sanctuary (KGS) resulted in recording 62 muggers reflecting a healthy population with a high number in the mid-size class. Muggers were mostly encountered from Magara Dabri to Judi in Madla. The habitat suitability analyses for gharials revealed that the entire stretch of Ken River, from PTR to KGS, could be characterised into five suitability classes. With a habitat area of 3.4 sq km falling in the very high suitability class, 9.4 sq km in the high suitability class, 10.0 sq km in the moderate suitability class, 6.4 sq km in the low suitability class and 0.4 sq km in the very low suitability class. The PVA for gharials after 100 iterations revealed that the current population requires supplementation and support from an ex-situ hatchling facility once a nesting population is formed in PTR.

Biodiversity: A total of 206 avian species were recorded in PTR, including resident non-endemics (132 species), endemic to India (32 species), non-endemic (24 species) and data deficient (18 species). Results of spatial conservation prioritization using Marxan reveal that in GPL categorizing planning units based on cost and biodiversity richness, 1,388 units have low conservation cost and low biodiversity richness, 990 units have low cost and moderate richness, and 430 units have low cost and high richness. Similarly, 103 units have moderate cost and low richness, 34 units have moderate cost and moderate richness, and 23 units have moderate cost and high richness. Ninety-seven units have high cost and low richness, 36 units have a high cost and moderate richness, and 17 units have high cost and high richness. Out of a total of 3,236 planning units,

1,356 units were selected by Marxan as the best solution (fulfils target with minimum cost). Based on the spatial prioritization output, areas prioritized for the conservation of biodiversity richness in each district were identified.

Community: One hundred and three villages were identified in GPL for developing forest resource-based cooperatives and growth centres.

Habitat consolidation: Bringing information from the field, spatial prioritization and connectivity modelling, the overall map was prepared to depict all the areas proposed for habitat consolidation.

Habitat consolidation: Bringing information from the field, spatial prioritization and connectivity modelling, the overall map was prepared to depict all the areas proposed for habitat consolidation.

Milestones

Field data was collected from the landscape, as well as PTR was completed for all the components of the Landscape Management Plan. Radio-tagging of 23 vultures and a UAV survey of Ken River for crocodilian population status assessment was successfully accomplished. Areas for landscape consolidation were identified, and specific prescriptions and recommendations for each key theme and zone were devised. The plan writing was completed after consultation with experts, district collectors and principal signatories.

AUGMENTATION AND LONG-TERM MONITORING OF TIGER IN BUXA TIGER RESERVE, WEST BENGAL

ONGOING PROJECT

Funding Source
West Bengal Forest Department

Investigator
Dr K. Ramesh

Researchers
Orvill Jude Nazareth, Shekhar Sarkar

Date of Initiation
April 2018

Proposed Date of Completion
March 2023

Objectives

The objectives of the project are to (i) strengthen field protection and intelligence-based enforcement for overall habitat revival; (ii) improve habitat quality and prey population stats to enable suitable conditions for tiger augmentation in Buxa Tiger Reserve and the landscape complex; (iii) augment tiger population from other source areas involving soft-release, and hard-release strategies towards ensuring a demographically, genetically, and physically (health-wise) viable population of tiger and its offspring; (iv) institutionalize monitoring of habitat condition, prey populations and tiger population so as to enable 24x7 security of released animals and for feedback mechanism for effective management and capacity building of staff on a regular basis; and (v) develop a landscape management plan in the context of tiger movement between Buxa and Jaldapara National Park, Buxa and Manas as well as Buxa and neighbouring forests of Bhutan.

Progress

The work plan was focused towards achieving the project objectives and was divided into the following activities:

At the landscape level, a database containing spatial data, *viz.*, boundary vectors, topography raster and their derivatives, hydrological data, disturbance data, climate, socio-economic data, and ecological data, were updated from the most recent data. Similarly, at

the reserve level, the layers of protection and management were updated. A land-use land cover map was prepared for the landscape to identify critical habitats and important corridors for tigers and other species to move between the protected reserves in the landscape. Data analysis using software, such as FRAGSTATS, to identify these corridors is ongoing. The layers assembled under the spatial database will be used to assess other ecological aspects, including identifying habitat suitability within the landscape for tigers, co-predators and prey.

The exercise continued from mid-November 2020 to mid-August 2021. The photographic capture rate of species was calculated for each grid and for the entire reserve. Occupancy and detection probabilities were estimated for species captured by camera traps during the exercise.

Camera trap sampling was subsequently planned for the reserve post-monsoon, from November 2021 onwards. Camera traps were deployed as planned, keeping in mind the crucial areas where tiger movement was anticipated from the previous years. 2 km^2 grids were used to sample the entire reserve. Grids were classified as focus grids, where the movement of tigers was found or was anticipated to be found. Cameras in the focus grids were stationed throughout the sampling period, and the non-focus grids were covered block-wise with a target of 30 trap nights. Each grid was sampled using double-sided camera traps, and one location in each grid was sampled. Prior to the start of the exercise, one-day training was provided for each range to staff on deployment and monitoring of camera traps in the field, and in addition to this, maps were prepared at a range and beat level for the convenience of the ground staff. Apart from the systematic sampling, camera traps were also deployed opportunistically at sites where animal kills were reported.

Phase I and Phase IV monitoring exercises were conducted for BTR under the All India Tiger Estimation 2021-2022. Technical support was provided for data collection from the field through the android based mobile application.

Each activity specified above is executed with the active involvement of field staff. Therefore, training schedules were organized on a regular basis for each of these activities. The training was organized at a range level.

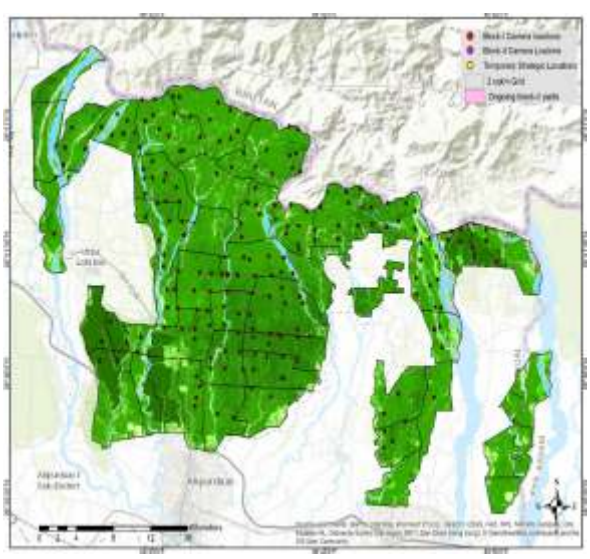
There is a need to document the sporadic visit of tigers in Buxa to better understand the species' habitat use. Camera trapping was done with a special focus on targeting regions of probable tiger movement and areas where tiger presence was documented in the past. Cameras were also deployed at animal kills in order to establish the possibility of it being caused by a tiger. Scats identified as potentially being tigers were sent to WII for molecular identification of the species.

These documents were updated based on the camera trapping exercises and are to help in management and protection purposes by the forest department.

Watch towers in BTR document observations of animal sightings at the towers using logbooks. The data documented in these logbooks at 24 monitoring stations throughout BTR was extracted and organized for analysing annual, seasonal, and daily trends in species activities at these towers. Each of these stations was also installed with a thermometer and hygrometers to record the environment temperature and humidity for each animal observation.

Outputs and Outcomes

A list of a total of 83 data layers was prepared for the spatial database. Shapefiles of national, state, district,



Map. Camera Trap Locations in BTR

village, protected areas, BTR ranges, BTR beats, and BTR compartments were obtained from online sources and the forest department. The shapefiles of range offices beat offices, watch towers; check posts, road networks and waterholes were updated from the field.

A total of 216 camera-trap locations were sampled. Grids in areas where the probability of capturing tigers was high were sampled at more than one location. Sampling was conducted over three blocks, and cameras were active for a minimum of 3 to 252 trap nights, totalling 16,426 camera trap nights throughout the reserve. A total of 23 major mammal species were recorded in the exercise. No photo captures of tigers were recorded from mid-November 2020 to mid-August 2021 Camera trap exercise. The relative abundance index of species and results of the occupancy estimation is shown in the figures below:

Capacity building of staff: Training was organized for all census techniques at the landscape level. At BTR, range-wise training was organized for practice on transect sampling, sign survey and vegetation survey. Training in camera trap exercises was organized for staff.

Focused monitoring of tigers: As a part of the project work plan and the All India Tiger Estimation Phase-IV exercise, camera trapping was conducted annually from mid-November. This period coincides with the period of increased encounters of indirect tiger signs (pugmark and scat). The exercise successfully captured photographic evidence of a single individual tiger at two locations containing double-sided camera traps. The individual was captured in the SRVK Beat of East Damanpur Range and WRVK Beat of West Rajabhatkhawa Range on 11 December 2021 at 12:03 am and 3:00 am, respectively.

Analyze long-term data from monitoring stations across BTR: As part of the continued wildlife and habitat monitoring efforts, every watch tower in BTR has been collecting data on animal sightings in the area. In addition to this, each watch tower was provided with thermometer-hygrometer devices to record the environment temperature and humidity for each animal sighting. The daily maximum and minimum temperature and humidity data are also being collected at these locations. Additionally, a network of rain gauges was distributed across the reserve in watch towers, beat offices and range offices in order to collect data on rainfall across the reserve.

Monitoring potential conflict for early warning and conflict management: To estimate the individual's home range, the Minimum convex polygon (100 per cent) was calculated using the adehabitatHR package in R software. The data was analysed using the Logistic regression model to identify the influence of anthropogenic factors on the activity of the individual. All analysis was carried out in R software. A total of 1,686 location points were locations were obtained by triangulation from 9th July 2020 up to 31 March 2022. The location points suggest that the individual is predominantly occupying areas outside the protected area. Within BTR, the individual frequented parts of the Kartik beat and was occasionally found in Mynabari beat.

Milestones

To prevent local extinction and to restore the viable population of the tiger 'The Tiger Augmentation and Recovery Project' was initiated as a long-term effort by the State, with the support of the Global Tiger Forum and Wildlife Institute of India and is now being implemented as a collaborative project of West Bengal Forest Department, National Tiger Conservation Authority and Wildlife Institute of India since 2018.

Throughout the project, preparatory work has been carried out regularly, including habitat mapping, prey base assessment, sign surveys and camera trapping

Fig. *Indirect evidence (pugmark and scat)*

for tiger and co-predators. The continued efforts have consequently resulted in the photographic capture of the tiger in BTR on 11th December 2021 and indirect evidence (pugmark) from multiple reserve regions since 7th December 2021.

Filling the gaps in the data and regularly reviewing the various data present for the region can help identify the trends in the changing landscape and address the issues that arise. Making the data available to the ground staff and managers through beat books and species album is key to this management.

CONSERVATION ACTION PLAN FOR MANIPUR'S BROW ANTLERED DEER OR SANGAI: AN INTEGRATED APPROACH

ONGOING PROJECT

Funding Source
Compensatory Afforestation Fund Management and Planning Authority (CAMPA) Ministry of Environment, Forest and Climate Change.

Investigators
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Dr S.A. Hussain

Researchers
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Date of Initiation
March 2016

Proposed Date of Completion
March 2023

Objectives

The objective of the project was to secure the long-term survival of Sangai in the wild. This proposal primarily addresses: (a) Strengthening the existing population in KLNP, (b) Establishment of a second population in the wild, (c) Improving habitat condition and protection measures, (d) Involving the local community in conservation efforts, and (e) Conducting applied research on the ecology of the species.

Progress

Strengthening the existing population in KLNP: (i) Integrated Management Plan of Keibul Lamjao National Park: In light of the conservation issues of Sangai, WII prepared an integrated management plan for the KLNP. Baseline scientific data on the population structure, genetic status, habitat conditions, socio-economic profile and dependence of the local communities on the Park resources were collected through systematic surveys, and a series of consultation meetings were carried out. Village-level meetings covering the 36 villages around the Park, followed by site-level meetings around KLNP with concerned stakeholders, were consulted, and their opinions regarding the Park's management and willingness to join in the management activities of the Park were also noted. Creating a second home for the long-term conservation of Sangai was also advocated during this workshop and meetings since it is an integral part of the long-term conservation strategy. All the suggestions and recommendations during the workshop have been incorporated into the management plan.

Establishment of a Second Population in Wild: (i) Development of Conservation Breeding Centre (CBC) for Sangai: A layout plan for developing a Conservation Breeding Centre (CBC) for Sangai at KLNP was prepared under the WII CAMPA-Sangai project in consultation with the Smithsonian Institute of Conservation Biology, USA and the National Institute of Animal Health following the Central Zoo Authority guidelines. The land filling at the identified site is ongoing in consultation with DCF (Park & Sanctuary), Manipur Forest Department, for further developing the CBC.

Improved Habitat Condition and Protection Measures: (i) Establishment of fire fighting stations at KLNP. The WII CAMPA-Sangai project handed over fire fighting equipment to the office of the DCF (Park & Sanctuary), Manipur Forest Department, on 20th April 2021. Subsequently, the Forest Department set up two fire fighting stations at existing anti-poaching camps in the Thangbirel (Range-I) and Khodangkhong (Range-II) areas of the Park. This was done following the direction of the Hon'ble Chief Minister Shri N Biren Singh during the 8th State Board for Wildlife Meeting held on 12th March 2021. In view of the frequent forest fire incidences inside the KLNP, especially during the dry season, he advised setting up fire fighting stations to aid in suppressing such fire incidences in the Park. As part of the handing over ceremony held at IB-I of KLNP, a half-day orientation programme on the use of fire fighting equipment was also organized for the frontline staff in the presence of the DCF (Park & Sanctuary) and Range Forest Officer, KLNP. Further training to build the capacity of the frontline staff to manage the fire outbreaks in the Park efficiently is being planned to organise with resource persons from the Manipur Fire Service.

Disease Surveillance: Disease surveillance is carried out periodically to identify diseases in Sangai and associated species in KLNP as well as in the livestock in surrounding villages. As part of this, the haemato-biochemical parameters of the Sangai from KLNP were assessed for monitoring the health and nutritional status. Four Sangai individuals (two stags and two hinds) relocated from Sangai Conservation and Breeding Centre, Langol and Manipur Zoological Garden, Iroisemba, were selected for Haemato-biochemical assessment. This is the first attempt to document the haematology and serum biochemistry of Sangai in India.

Involving the local community in conservation efforts: (i) Awareness and outreach programmes: As a part of this global celebration to highlight the increasing need to protect endangered species across the world, the WII CAMPA-Sangai team and the Office of the DCF (Park & Sanctuary), Manipur Forest Department organized online awareness programmes, quiz competition and webinars for celebrating important days including Endangered Species Day, International Day for Biological Diversity, World Environment Day, World Water Monitoring Day, World Clean-up Day, World Wetlands Day, World Wildlife Day, World Nature Conservation Day and National Teachers' Day, and Webinar series – "Know Your Loktak" and Webinar series – "Saving the pride of Manipur – Sangai. The primary objective of these programmes was to enhance public awareness of the plight and need for the conservation of endangered species, with special reference to the endangered Sangai of Manipur.

Livelihood Interventions: 2.1 Regular monitoring of women Self-Help Groups (SHGs) around KLNP: WII CAMPA-Sangai team and the Office of the DCF (Park & Sanctuary), Manipur Forest Department jointly organized a series of capacity-building training for local women Self Help Groups (SHGs) around KLNP in collaboration with the Green Foundation, and Manipur State Rural Livelihoods Mission (MSRLM). These training programmes include SHG membership training, bookkeeping training, financial inclusion training, and micro-credit planning. To keep up their interests and enhance their capacities, the WII team regularly monitored these trained SHGs. Each SHG conducts a weekly meeting and contributes a certain amount of money as their group savings. The SHGs are monitored weekly to check their books of record, inter-loaning process, group management progress and inter-member relationships for each group. In addition, bookkeepers are trained from time to time to keep their books of records up to date and be ready for evaluation at any point in time.

Establishment of Bank linkages with women SHGs: As per the norms given by the National Rural Livelihoods Mission, each SHGs member's personal accounts and joint accounts for every group was opened in the nearest Banks: Manipur Rural Bank at Moirang and Kumbi. With their weekly interaction with the bank employees, trust-building is made, along with their transaction records being monitored by the bank employees. At present, the team is initiating enrolment of the SHGs under MSRLM. The WII team, in collaboration with the MSRLM, are closely working with the SHGs to abide by such mandates of bank linkages.

Training on Micro-Credit planning for women SHGs: Micro-credit planning training programmes for members of SHGs were held to build the capacities of the SHGs on how and when to tap the financial opportunities and prioritize their credit needs for feasible livelihood planning at the micro/family level. Experts from the Manipur State Rural Livelihoods Mission (MSRLM) were invited to conduct the training. A total of nine SHGs comprising 92 members participated in the training. The current activity is a part of the broader ecodevelopment activities around the KLNP with the ultimate goal of weaning away the dependence of local people on the Park resources through such livelihood intervention.

Conducting Applied Research on the Ecology of the Species: To improve habitat conditions and enhance protection measures, areas vulnerable to poaching

and human disturbances have been identified, and appropriate measures have been incorporated into the management plan. Patrolling routes by foot, boat and vehicle have been identified and mapped. Monitoring of phumdi thickness, water level and tall grass management areas for improved habitat conditions have been mapped.

Habitat Monitoring: Habitat improvement is one of the most important steps towards Sangai conservation, areas vulnerable to poaching and human disturbances have been identified, and appropriate measures have been incorporated into the management plan. Patrolling routes by foot, boat and vehicle have been identified and mapped. Monitoring of phumdi thickness, water level and tall grass management areas for improved habitat conditions have been mapped. A Pellet distribution survey and vegetation transect are being carried out across the season to study the habitat use pattern of Sangai and associated species. In addition, as a part of habitat monitoring, vegetation sample along with *phumdi* thickness, water level, ground cover and disturbance signs were also recorded respectively.

Conservation Genetics: Understanding the patterns of genetic variation is crucial for planning effective conservation strategies. This study investigated the phylogeography, divergence events and systematics of Eld's deer subspecies using the largest mtDNA dataset compiled to date. The results showed that *R.e. siamensis* exhibits two divergent mtDNA lineages (mainland and Hainan Island), which diverged around 0.2 Mya (95% HPD 0.1–0.2), possibly driven by the fluctuating sea levels of the Early Holocene period. The divergence between *R.e. eldii* and *R.e. siamensis* occurred around 0.4 Mya (95% HPD 0.3–0.5), potentially associated with the adaptations to warm and humid climate with open grassland vegetation that predominated the region. Furthermore, *R. e. eldii* exhibits low levels of genetic diversity and a small contemporary effective population size (median=7, 4.7–10.8 at 95% CI) with widespread historical genetic bottlenecks, accentuating its vulnerability to inbreeding and extinction. Based on the observed significant evolutionary and systematic distance between Eld's deer and other species of the genus *Rucervus*, the research team proposed to classify Eld's deer, *Cervus eldii*, in the genus *Cervus*, which is incongruent with previous phylogenetic studies. This study provided important conservation implications to direct the ongoing population recovery programs and plan future conservation strategies

Outputs and Outcomes

Integrated Management Plan of Keibul Lamjao National Park has been prepared and released. Collaborative implementation by the Manipur Forest Department and Wildlife Institute of India is underway. An action plan for conservation breeding is in place, and the development of the conservation breeding centre at KLNP has been initiated.

Milestones

Collaborative implementation of the integrated management plan of KLNP for strengthening the existing population of Sangai and associated species and improving the habitat quality of KLNP. (ii) Disease surveillance of wild and captive populations of Sangai and Hog deer and strengthening liaison with the Veterinary and Animal Husbandry departments and keeping up-to-date about veterinary practices. (iii) Development of strong conservation-development linkages through skill development, SHG formation and mass awareness of Sangai conservation. (iv) Continuation of sensitisation and consultation with the local communities of the reintroduction site and develop effective mechanisms to address their livelihood issues. (v) Monitoring the population trend of Sangai and associated species in KLNP to examine the population trend using standardised population estimation method and also using drone or Unmanned Aerial Vehicles (UAV) surveys. (vi) Monitoring of *phumdi* thickness, plant community structure, water quality parameters and invasive species to examine the change in the habitat quality in KLNP. (vii) Genomic analysis of Sangai using advanced genome sequencing technology and monitoring of stress physiology of Sangai and associated species in KLNP will be conducted to gather crucial information on its genetic status. (viii) Monitoring of biomass extraction and the resulting consequences on the Park ecology will be monitored using household surveys and ecological assessment of the Park.

UNDERSTANDING LARGE CARNIVORE CONFLICT ISSUES IN MAHARASHTRA FOR SUGGESTING CONFLICT REDUCTION MEASURES

ONGOING PROJECT

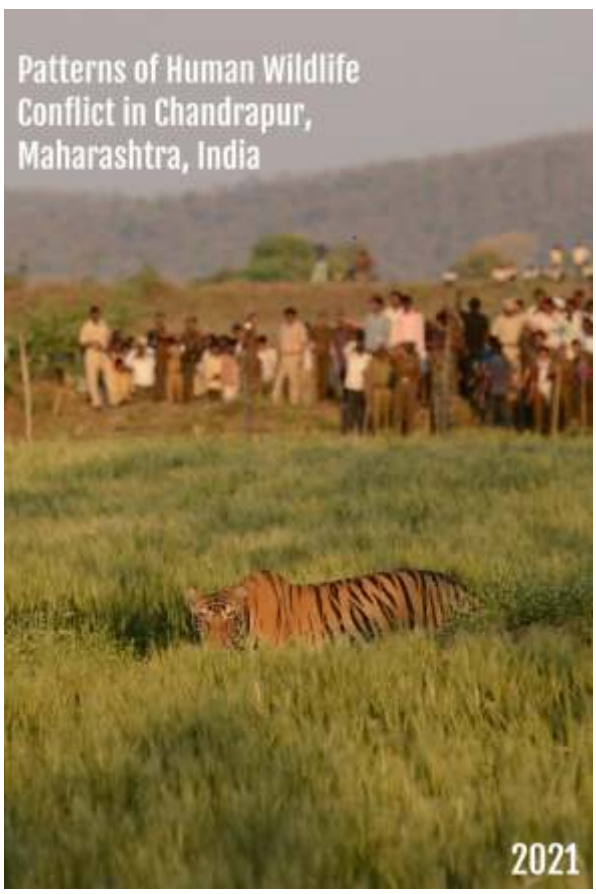
Funding Source
Maharashtra Forest Department

Investigators
Dr Bilal Habib
Dr Parag Nigam

Researcher
Advaita Ravindran

Date of Initiation
April 2019

Proposed Date of Completion
March 2023



Objectives

The project has the following objectives (i) develop the village-level database of various habitat and land use characteristics; (ii) assess the present status of large carnivores and prey in the area; (iii) assess the diet of large carnivores using scat samples; (iv) assess villages' vulnerability to conflict on the basis of various factors; (v) Suggest measures for mitigating conflict; and (vi) develop early warning systems to prevent potential conflict situations.

Progress

Incident-wise conflict details have been collected from 4 of the Forest Circles of Eastern Vidarbha Landscape, including Nagpur, Chandrapur, Yavatmal and Amravati for the creation of a baseline database of large carnivore conflict data. These incidents need to be analysed to understand the spatiotemporal patterns of large carnivore conflict in the landscape and their causative factors. A project report containing the spatial hotspots of large carnivore conflict incidents from Chandrapur Forest Circle has been submitted to Maharashtra Forest Department.

Outputs and Outcomes

The Central Indian Landscape (CIL) is one of the regions with high tiger populations and density in India, with 6 Tiger Reserves featuring heavily as source populations, including Tadoba Andhari, Pench, Kanha, Satpura and Melghat Tiger Reserves. CIL supports a large percentage of the total tiger population in India and has been demarcated as a global priority landscape for tiger conservation. But there is a disproportionate decline in forest cover as well as quality, which means that even though the populations of tigers are thriving, there isn't enough pristine forest to support their growing numbers. This eventually leads to a spill-over of the carnivores into surrounding human-dominated landscapes (HDL). This acts as one of the major reasons for the burgeoning number of conflict cases between humans and tigers. The Vidarbha Landscape (VL) of the state of Maharashtra is facing a similar decline in forest cover, leading to an increase in conflict cases.

Records of conflict incidents collected from Chandrapur Forest Circle were analysed to understand the spatiotemporal patterns of large carnivore conflict in the region.

Milestones

The conflict data collected from Chandrapur Circle was analysed and compiled into a report. Conflict data was collected for the rest of the study area, including 4 Forest Circles in Vidarbha Landscape, *viz*., Nagpur, Chandrapur, Yavatmal and Amravati. This data set will be analysed and presented in the form of both project reports, as well as peer-reviewed scientific articles.

MOVEMENT ECOLOGY OF TIGERS, *PANTHERA TIGRIS* FOR CONFLICT PREDICTION AND LANDSCAPE MANAGEMENT IN SATHYAMANGALAM - NILGIRI BIOSPHERE RESERVE COMPLEX, SOUTHERN INDIA

ONGOING PROJECT

Funding Source
National Tiger Conservation Authority (NTCA)

Investigators
Dr K. Ramesh, Dr Vaibhav Mathur (NTCA) and Mr Rajendra Garawad

Researchers
Meera Makwana and Alljo A. Paul

Date of Initiation
March 2018

Proposed Date of Completion
March 2023

Objectives

The objectives of the project are to (i) study the spatiotemporal movement pattern of tigers between the population clusters; (ii) predict the human-tiger conflict probabilities in the current and future context based on actual and simulated movement and landscape analyses; and (iii) develop landscape management strategy integrating the emerging knowledge and existing tiger conservation plans.

Progress

The research team developed a spatial database for the landscape. The details of spatial layers maintained as a database are given below:

Modelled Corridor Connectivity: Linkage Mapper predicted eighty-four connectivity links across 41 tiger habitat cores, among which sixty-seven were potential corridor links. Among the predicted Least Cost Paths (LCPs), the shortest distance of 1 km was represented by that connecting habitat cores 5–9,

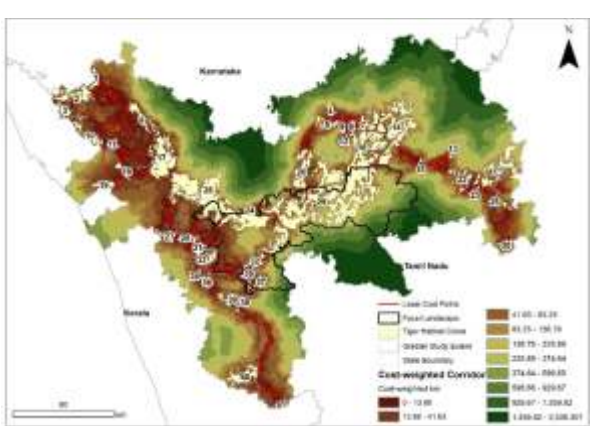


Figure 1. Predicted cost-weighted corridors across 41 habitat cores (labelled for reference)

while the LCP connecting habitat cores 38-40 was the longest (79.254 km). Overall, the habitat cores lying in the central part of the landscape between the Western and Eastern Ghats appeared clustered closer, with smaller link distance predictions.

Spatial Layer	Layer Format	Source	Year	Resolution (Meter)
Elevation	Raster	ASTER DEM	-	30
Slope	Raster	ASTER DEM		30
NDVI	Raster	Landsat-8 SR	Annual mean-2021	30
NDWI	Raster	Landsat-8 SR	Annual mean-2021	30
Forest Cover	Raster	Forest Survey of India	2017	100
Human Footprint Index	Raster	Last of Wild- HFP Asia v.3	2009	1000
Land Use/ Land Cover	Raster	Copernicus Space Agency	2017	100
River Streams/Watershed	Vector	Digital Charts of the World	-	-
Roadways	Vector	DIVA GIS	-	-
Major Railways	Vector	DIVA GIS	-	-
Administrative Boundaries	Vector	Survey of India	2016	-
Protected Area Boundary	Vector	GIS Cell, WII	-	-

Biodiversity Richness Potential: The biodiversity richness potential analysis was done using multiple thematic layers, and the resultant values varied across the landscape. The richness potential was further described into three classes low, medium and high. The estimated values ranged from 0.21 to 0.58, with a mean score of 0.39. The results indicate that Nilgiri south (86%) has the largest percentage of the area falling under the high biodiversity potential class. Results of the analysis depict the western part of the landscape as a high biodiversity richness potential area and most of the areas falling near the edges of the landscape as having low biodiversity richness potential. The model, however, needs to be validated and strengthened using field data, which is planned to be generated later in the study.

Outputs and Outcomes

While other spatial data generated will serve as a baseline in selecting regions to focus research efforts on, modelled connectivity corridors will provide crucial management inputs to mitigate human-tiger conflict in the landscape. The predicted corridors can be verified on the ground and can potentially inform the identification and prioritisation of crucial conservation areas for tigers, as well as can be focussed upon for habitat and conflict management in the landscape.

The results generated can serve a key role in bringing about a landscape-oriented management approach, which is imperative to current conservation needs and will simultaneously benefit both biodiversity and management initiatives. Additionally, the results and methodology potentially involve inputs from the landscape managers, further aiding in scientifically informed management in the landscape.

Milestone

Management inputs were provided to the state forest department during the release of rescued tiger cubs from the landscape into a bigger enclosure to facilitate rewilding.

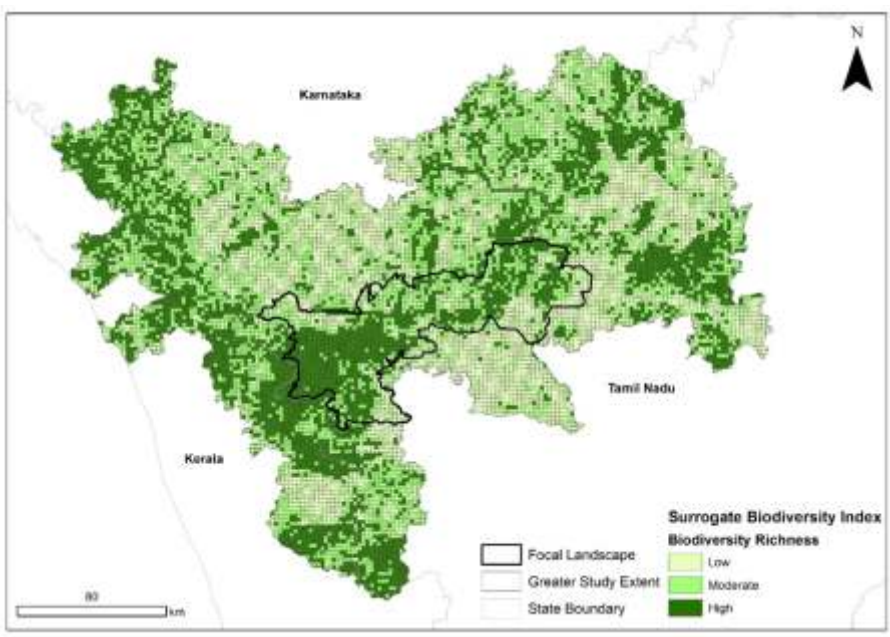
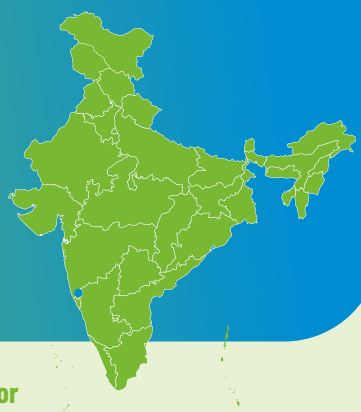


Figure 2. Predicted surrogate biodiversity richness map

ONGOING PROJECT

SPATIAL MAPPING OF CRITICAL MARINE HABITATS OF MALVAN COAST FOR REORGANIZATION OF BOUNDARY OF MALVAN MARINE SANCTUARY



Funding Source
Mangrove Foundation/ Mangrove Cell, Maharashtra Forest Department

Investigator
Dr Gautam Talukdar

Researcher
Noah Shinde

Date of Initiation
March 2021

Proposed Date of Completion
March 2023

Objectives

The objectives of the project are to (i) conduct a rapid assessment of the current status of marine biodiversity of MMS through a multi-seasonal survey; (ii) identify and demarcate high-priority habitats within and around the sanctuary to advise management interventions and delineate *vis-à-vis* fishing and tourism zones; and (iii) build the capacity of the frontline forest personnel and local communities to monitor marine biodiversity and generate conservation awareness.

Progress

During the data collection and reporting period, (i) intensive surveys have been carried out along the sanctuary and other locations adjoining the sanctuary; (ii) habitat quality index for corals and fish computed; (iii) habitat mapping and threat assessment; (iv) drone training workshop was conducted; and (v) fish catch assessment from the local market. The analysis and spatial mapping of critical habitats were completed, overlaying threats and high biodiversity zone. Sites ideal for conservation with minimum threats and conflict have been demarcated.

Outputs and Outcomes

Marine diversity survey: Seasonal replicates were taken for the sites within the sanctuary. Priority was given to areas with highest tourist influx and known coral reefs present along the Malvan coast. Parallel assessment of corals, fishes and anthropogenic threats were done at 20 dive sites. Along with the offshore sampling area, the beach within the sanctuary area was assessed for anthropogenic waste. The hard coral cover was observed to be 28%, while the seagrass cover was observed to be 3% along the 20 dive sites. In all, 19 genera of corals were identified. A total of 122 species of fish belonging to 38 families were observed during underwater surveys. A total of 28 different fish species were observed during market surveys. Eleven of the twenty sampling sites were observed to have high biodiversity with comparatively low threat and conflict.

Fish catch assessment: A total of 44 different fish species were observed during the market surveys. Fishes such as the Silver pomfret, Black pomfret, Indian mackerel, King mackerel were the most common fishes observed.

Solid waste survey: The solid waste observed in beach litter surveys mostly composed of plastic bottles, polythene materials, and Styrofoam, with higher volumes in areas within the Malvan Marine Sanctuary core zone. Littering of these areas can be attributed to the absence of a waste management/disposal plan and high influx of tourists. Owing to the prevailing monsoon winds, a deposition of tar was observed washed onto the beach. Litter surveys at dive sites and at sea surface were not able to provide sufficient data to make a strong assertion owing to the changing physical conditions. Discarded ghost nets and plastic products were observed at some sites.

Mapping of important marine habitat: 7 Rocks, Bhootnath, Classroom, Sargassum, Middle rock, Old and New Light house, Chiwla, Shengale Mandal, Ghode Mandal, Ekicha Dhonda and Kawda are important habitats with higher biodiversity and lower threat in comparison to the others. It is also evident that the sites (King's Garden 1, 2 and 3) within the core zone of the Malvan marine sanctuary now have low biodiversity attributing to the high anthropogenic stress. Prioritized areas along the coast of Malvan were clubbed in 3 categories viz. Potential PA, Conservation Priority areas & Sensitive Areas.

Training workshop and local community discussions: Drone training workshop, scuba diving workshop and discussion with local communities were organized.

Milestones

Extensive survey was done to identify different marine biodiversity and different threats in the Malvan Marine Wildlife Sanctuary. Important marine habitats (i.e. Potential PA, Conservation Priority Areas and Sensitive Areas) along the Malvan coasts were identified. Different training workshops has been conducted.

ONGOING PROJECT

RECOVERY OF DUGONGS AND THEIR HABITATS IN INDIA - AN INTEGRATED PARTICIPATORY APPROACH

Funding Source
National CAMPA Authority, New Delhi

Investigators
Dr J.A. Johnson
Dr Nehru Prabhakaran

Date of Initiation
April 2016

Proposed Date of Completion
March 2023

Objectives

(i) Species conservation and management: Assess dugong population status through advanced census techniques, identify critical habitats, classify threats and develop site-specific monitoring plan; *(ii) Habitat conservation and management:* Characterize the critical dugong habitats, reduce and indirect threats participatory approaches; *(iii) Participatory management of dugong and their habitats:* Raise awareness on the species and encourage the participation of the local communities, include other stakeholders in conservation efforts and enhance dugong conservation program by the spread in awareness on a national scale; *(iv) Capacity-building of state forests department & local communities:* Enhance the capacity of the State Forests Department staff; train staff and local communities in the underwater survey for long-term habitat monitoring

Progress

Population estimation of dugongs was carried out using Drone techniques. The research team found dugong encounter rate of dugongs in the Ritchie archipelago – 0.6/sq km, Mahatma Gandhi Marine National Park – 1.85/sq km and Palk Bay – 0.7/sq km. Based on the stranding records, fisher folk information and sighting records, critical dugong habitats and threat maps were mapped in Gujarat, Tamil Nadu and Andaman & Nicobar Islands, and threat maps for respective critical dugong habitats were generated. Dugong volunteer network was created, and more than 1,000 people registered as volunteers cutting across different stakeholders (fishermen, coast guards, marine police, local youth, tourist guides and divers). As part of the capacity-building programme, training SCUBA training and underwater monitoring techniques were provided to the front-line forest staff.

Outputs and Outcomes

Under the research and monitoring programme, seagrass meadow characterisation, species composition and seagrass cover map were generated. Based on the output of sighting records, stranding reports and fisher folk information, critical dugong habitats were identified in Palk Bay and the Gulf of Mannar Marine National Park. This information's outcome has translated to the formation of the Dugong conservation reserve in Tamil Nadu. We also studied the food preference of dugongs based on the gut samples of stranded animals and found that species of *Cymodocea* spp. and *Halophila* spp. are highly preferred by dugongs. Attempts were made to estimate the dugong population in Palk Bay using Drone technology and found promising results. As part of the capacity-building programme, a series of SCUBA diving training were organized for forest rangers/ foresters. More than 20 frontline staff were trained in SCUBA diving and underwater monitoring skills.

A marine mammal stranding response workshop was also organised for veterinary officers and range forest officers to manage live and dead marine mammal strandings. As part of the outreach activities dugong scholarship programme was introduced in coastal villages of Tamil Nadu. So far, 550 students have been enrolled under this programme, and students were provided a scholarship amount of Rs. 500/ month for two years to support their education. In addition, continuous outreach activities such as mass boat surveys, fisher community meetings, and important environmental day celebrations were conducted in Palk Bay and the Gulf of Mannar region. These multi-pronged outreach efforts have turned into a dugong volunteer network that provides information on dugong sightings/stranding, enabling management to respond swiftly and initiate necessary action on the ground.

Milestones

The following have been achieved: Creation of dugong volunteer network in dugong range states; Dugong estimation technique based on drone standardization; Identification of critical dugong habitat; 54 forest staff trained in SCUBA diving and underwater monitoring; About 500 school going children of fisherman were supported through monthly scholarship on a competitive process; and As part of the capacity building program, Marine Mammals Stranding Response workshop was organised for Range Forests Officers and Wildlife Veterinarians

ONGOING PROJECT

TRACKING THE NEARSHORE AND MIGRATORY MOVEMENT OF OLIVE RIDLEY TURTLES OCCURRING IN THE COASTAL WATERS OF MAHARASHTRA

Funding Source
Mangrove Foundation

Investigator
Dr R. Suresh Kumar

Researcher
Mohit Mudliar

Date of Initiation
January 2021

Proposed Date of Completion
April 2023

Objectives

The objectives of the project are to (i) track the nearshore movement of olive ridley turtles and understand habitat use during the breeding season along the Maharashtra coast; and (ii) track the post-nesting movement of turtles nesting on the Maharashtra coast and explore details of Diving behaviour.

Progress

As proposed in the project, five olive ridley sea turtles were successfully captured and tagged at three nesting beaches on the Maharashtra coast between January and February 2022. The turtles were tracked for their near-shore movements and migration and could only be tracked till August 2022 as the transmitters seized transmission.

Outputs and Outcomes

Of the five turtles tagged, one stopped transmission a few days after release and may have died due to incidental capture in fishing net in the area. The four others provided information on their near-shore movements. Interestingly, two of the tagged turtles returned to the beach to nest again after one month from tagging. The turtles started moving out to deeper waters from the start of March, possibly influenced by changing currents in the Arabian Sea. The southernmost location that any of the tagged turtles reached was the nearshore waters of Mangalore in Karnataka. On the other hand, one of the turtles moved northwest as far as offshore of Diu coast. The turtles remained within the continental shelf, where the maximum depth was 150 m. The deepest dive made by one of the tagged turtles was 330 m. However, during their presence on the continental shelf, the turtles, on average, dived to a depth of 45 m. Individual differences among the tagged turtles were observed in the diving behaviour, and this varied across their location and time.

Milestone

This project is the first satellite tracking effort to understand the movements and migration of any sea turtle along the west coast of India and the first to study their diving behaviour.

ONGOING PROJECT

AN INTEGRATED APPROACH FOR CONSERVATION OF MISHMI TAKIN, *BUDORCAS TAXICOLOR TAXICOLOR* IN NORTH-EAST INDIA: LINKING SPECIES ECOLOGY AND TRADITIONAL ECOLOGICAL KNOWLEDGE

Funding Source
Ministry of Environment Forest and Climate change (MoEF&CC), Govt. of India

Investigator
Dr Gopi G.V.

Researchers
Gaurav P.J. and Sirumai Kushiyali Kri

Date of Initiation
July 2019

Proposed Date of Completion
May 2023

Objectives

The objectives of the project are to (i) Assessment of the distribution and status of Mishmi Takin in Arunachal Pradesh; (ii) Understanding of the local and transboundary movement pattern of Mishmi Takin in the landscape; (iii) Identify threats, including evaluation of traditional ecological knowledge (human dependence and use) on Mishmi Takins; and (iv) Develop a conservation action plan for this species in Arunachal Pradesh.

Progress

After reviewing all available primary and secondary sources of information on 4 Takin subspecies worldwide, we got an understanding of Mishmi Takin's ecology and distribution; Using the datasets mentioned above, the research team carried out Species Distribution Modeling, and design methodologies such as camera trapping and questionnaire surveys carried out in identified potential habitats in Arunachal Pradesh. Based on this, we selected Dibang valley, Lower Dibang valley, and Anjaw Districts of Arunachal Pradesh, which consist of critical protected areas like Dibang Wildlife Sanctuary, Mehao Wildlife Sanctuary, and Kamlang Tiger Reserve, respectively.

Key informative surveys were conducted through formal discussion to understand species ecology and the social and cultural importance of the species. Meanwhile, an informal discussion was done by participating in local indigenous tribes' day-to-day activities like a funeral, farming, and sacred rituals.

During Camera trapping surveys, the research team also did sign surveys and vegetation sampling to understand occupancy, habitat, and usage by species.

Outputs and Outcomes

The research team obtained potential habitat for Mishmi Takin by Species distribution Models using secondary literature & primary datasets consisting of indirect and direct presence records of Mishmi takin. The team has deployed 83 camera trap locations in Dibang valley, covering both P.A. and Non-PA, out of which we have captured Takin at 28 locations. The Habitat Suitability Index in ArcGis predicts potential habitat and is categorized into three categories as 69.39% of areas Low, 27.60% of areas Moderate, and 2.99% of areas having High and a total of 72.38% potential habitat for Mishmi takin Meanwhile, the team continued to understand traditional rituals and hunting techniques by indigenous tribal people like Idu Mishmi, Diagru Mishmi, and Miju Mishmi. Through the key informative surveys, the team also continued to gain traditional ecological knowledge of species to have a better understanding of species. The research team also recorded flora that acts as food for Takin in the study area; therefore, in the process, the team identified 54 Plant species from different categories that are preferred by Takin. In these, they feed upon different parts of the flora.

Milestones

Extensive camera trapping has been carried out in Dibang Valley District to asses the distribution on Mishmi Takin. Key areas for Mishmi Takin interms of feeding grounds post calving and natural mineral licks used by Mishmi Takin has been identified.

ONGOING PROJECT

ECOLOGY AND CONSERVATION PERSPECTIVES OF THE FISHING CAT IN EGREE (EAST GODAVARI RIVERINE ESTUARINE ECOSYSTEM) IN ANDHRA PRADESH, INDIA

Funding Source
Andhra Pradesh Forest Department

Investigator
Dr Bilal Habib

Researcher
Soumya Banerjee

Date of Initiation
June 2021

Proposed Date of Completion
June 2023

Objectives

The objectives of the project are to (i) study various aspects of the ranging, spatial ecology and multiple-scale habitat use of the vulnerable Fishing cat, *Prionailurus vieverrinus* in the EGREE landscape; (ii) estimate the population density and abundance of the species in the landscape; (iii) study the dietary composition of the species; (iv) develop and participate in the implementation of a science-based conservation programme for the Fishing cat in the landscape in coordination with local stakeholders, *viz*. the Forest Department, fishermen, farmers and other key components of the local community.

Progress

Initial activities performed during the year 2021-22 have pertained to the establishment of an organizational environment conducive to the efficient achievement of fieldwork objectives. A number of discussions were held with key stakeholders, *viz*. the local staff and division-level officials of the Forest Department, fishermen and farmers of the local community for coordinating fieldwork. A survey totaling 40km of effort by boat and foot was carried out as preliminary recess in order for familiarization with the fieldwork environment. These were used to determine locations of focus for subsequent activities, such as scat sampling and camera trapping.

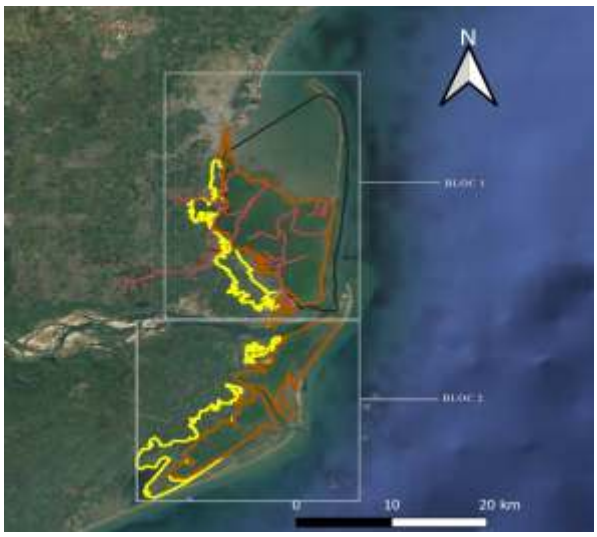


Figure1. Coringa WLS and surrounds, orange represents the distributaries of the Godavari river, yellow represents aquaculture ponds

The research team collected 46 scats after covering a distance of approximately 120km on boat and foot. Morphological properties of scats were recorded, along with GPS coordinates. Scats that could not be unambiguously assigned to Fishing cats were collected using butter paper for processing prior to genetic analysis. The team installed 25 camera traps at various locations within Coringa Wildlife Sanctuary (CWS) with the objective of identifying areas intensively used by the Fishing cat. Also, prior to the process of live capture, a large Havahart Woodstream Live Animal Cage Trap™ with dimensions 32x10x12 inches was procured. It was kept out in the field for 20 trap nights with the trapping mechanism deactivated to get the Fishing cats familiarized with it.

Outputs and Outcomes

Among the 46 scat samples collected, 21 were tentatively assigned to be those of the Fishing cat based on morphological characteristics. The remaining 25 were processed for genetic analysis, which is underway. One hundred and ten independent captures of Fishing cats were obtained across 716 trap nights. One hundred twenty-one independent captures of Golden Jackals and ten independent captures of Smooth-coated otters were also obtained during this period, along with several species of birds inhabiting the mangrove and swampy habitat of the sanctuary.

Fishing cats were observed to interact with the trap cage, and based on the camera trap footage obtained; modifications were made to the cage dimensions using locally sourced materials. This was done so as to ensure easy entry of Fishing cats into the cage itself. Various types of bait, including different types of fish, chicken and cat food, were used, and the behaviour of Fishing cats and sympatric carnivores was observed therein. It appeared that fresh mullets were preferred the most. However, it also became apparent that steps need to be taken to prevent insect infestation of baits. Currently, the process of analysing both camera trap data, aiming to study habitat associations and activity patterns, and establishing baseline density estimates and scat samples for analysing dietary composition is underway.

Milestones

The presence of Fishing cats at multiple locations within and around the CWS on the basis of camera trap images and sign surveys was established. It was the first use of a trap cage anywhere in the country for the live trapping of Fishing cats, with extensive emphasis given to the process of studying how Fishing cats interact with the trap cage. Areas of extensive use of Fishing cats taking into account the intrinsic difficulties of operating in muddy mangrove terrain, were identified.

Figure. Camera-trapped pictures of Fishing cats and other wildlife obtained from Coringa Wildlife Sanctuary

ONGOING PROJECT

ASSESSMENT OF DISEASE PREVALENCE IN UNGULATES IN PROTECTED AREAS OF MIZORAM

Funding Source
Ministry of Environment, Forest and Climate Change

Investigators
Dr Lallianpuii Kawlni, Dr S. Sathyakumar, Dr Vishnupriya Kolipakam and Shri Qamar Qureshi

Researcher
Akangshya Priya Gogoi

Date of Initiation
December 2019

Proposed Date of Completion
June 2023

Objectives

The project aims to assess baseline data on the prevalence of diseases of importance in ungulates.

Progress

Samples were collected from Murlen National Park, Dampa Tiger Reserve and Ngengpui Wildlife Sanctuary from the wild and their respective fringe villages from domestic animals, parasitological, bacterial and viral pathogen screening. Parasitological and bacterial screening is completed, and DNA extraction for viral screening is going on. The collection of invasive biological samples involves the capture of the animals; hence chemical anesthesia was done, and samples were collected. During this procedure, the staff and animal attendants, including the Veterinarian and Veterinary Field Assistant, were acquainted with this procedure.

Population estimation was done using camera-based distance sampling as this information is unavailable as a highly under-studied area and is crucial for continuing disease surveillance in the landscape.

Outputs and Outcomes

The following M.Sc. dissertation and paper are the outcome of the project: (i) Responses of wild ungulates to anthropologic pressure and perception of local communities towards conservation of wild ungulates in Dampa Tiger Reserve, Mizoram, India by Joonu Chakma; and (ii) Conference paper presented at the Mizoram Science Congress 2022. Title: Perspectives on human-wildlife coexistence and its drivers in villages of Dampa Tiger Reserve, Mizoram.

Milestones

The population estimation of ungulates was completed in study areas. The parasitological and bacterial screening was done. One M.Sc. dissertation has come out of this project. A conference presentation on the questionnaire survey was conducted during the study.

ONGOING PROJECT

MOVEMENT IN SPACE AND TIME: ECOLOGY OF RED FOX IN TAWANG UPPER VALLEY, EASTERN HIMALAYA, INDIA

Funding Source
National Mission on Himalayan Studies (NMHS)

Investigator
Dr Bilal Habib

Researcher
Dr Hussain Saifee Reshamwala

Date of Initiation
July 2020

Proposed Date of Completion
July 2023

Objectives

The objectives of the project were to (i) study the spatial ecology of a red fox by radio-collaring and studying home range, activity and movement pattern; (ii) study the foraging behaviour of red foxes across seasons; and (iii) study the spatiotemporal habitat use and the diet of the red fox in human-dominated landscapes with the increasing human population.

Progress

Field work for capturing red foxes was initiated on 10th July 2021 in the upper valley region of Tawang district, Arunachal Pradesh. The foraging behaviour of red foxes was studied with the help of scat analysis.

Outputs and Outcomes

A total of 227 scats were collected during the fieldwork. Insects were the main food item in Tawang (46.30 %), followed by rodents (39.47 %) and lagomorphs (7.03 %). The bird was present in only 3.89 % of scats, while other food items such as wild carrion, seeds and other plant material constituted less than 3 % of the diet. Plastic and egg were found only in 2 scats. Since insects were the main food item, they were further classified into tiger beetle, dung beetle, long-horn beetle and katydid.Dung beetle and tiger beetle were present in larger quantities (18.53 and 17.76%, respectively) as compared to others. Long-horn beetle comprised 6.06%, and katydids constituted 3.92% of the red fox diet.

Milestone

In first in the State of Arunachal Pradesh, One red fox was GPS collared at Tak-Tsang Gompa, near Tawang, Tak-tsang Gompa and monitored. To understand the diet of the red fox in Twang landscape, scats for same has been collected.

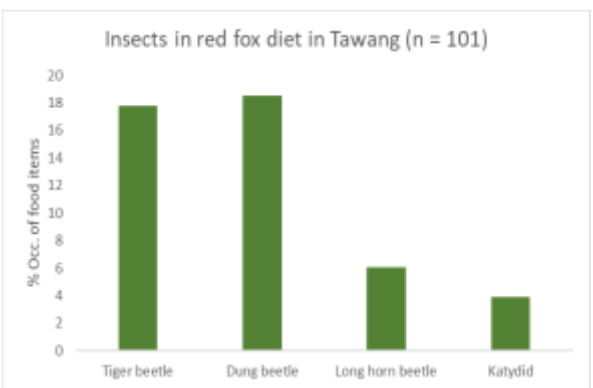


Figure .1. Percentage occurrence of different food items in the diet of red fox at Tawang, Arunachal Pradesh.

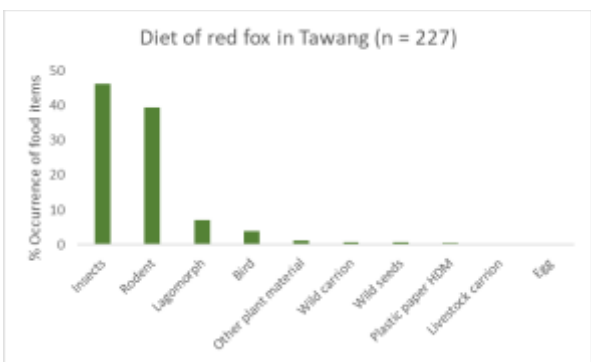


Figure. 2. Percentage occurrences of different insects consumed in the diet of a red fox at Tawang, Arunachal Pradesh

ONGOING PROJECT

RESPONSE TO ANTHROPOCENE AND CLIMATE CHANGE: MOVEMENT ECOLOGY OF SELECTED MAMMAL SPECIES ACROSS THE INDIAN HIMALAYAN REGION

Funding Source
National Mission on Himalayan Studies (NMHS)

Investigator
Dr Bilal Habib

Researchers
Dr Hussain Reshamwala and Prasad Tonde

Date of Initiation
July 2020

Proposed Date of Completion
July 2023

Objectives

The objectives of the project are to (i) study the movement patterns of Pallas's cat, Himalayan wolf and Himalayan Marmot with respect to Anthropocene and climate change in the Indian Himalayan Region (IHR); (ii) study the spatiotemporal habitat utilization, feeding ecology and life history traits of the selected mammal species in the IHR; and (iii) predict fine-scale distribution pattern of the selected mammal species in the IHR based on telemetry data for predicting change under anthropogenic and climate scenarios

Progress

Apex predators already existing at higher elevations, like Woolly wolves, can be severely affected because of the absence of suitable refuge. These wolves are poorly studied, and their current extant and distribution remain unknown. Concomitantly, in the era of the Anthropocene, the change in land-use land cover is rapidly increasing. Even the most adaptable species occurring in human-dominated landscapes may fail to cope-up with the combined impact of both climate change and human pressure. The research team collected 3,776 presence locations of Wooly wolves across its range from published literature and compiled 116 predictor variables for species distribution modelling, which included anthropogenic factors, climatic, vegetation and topographic features.

The team predicted the change in their distribution under different anthropogenic factors, climate change, and land-use land-cover change scenarios. Wolf showed affinity towards areas with low to moderately warm temperatures and higher precipitations. The future projections showed an expansion of wolf distribution and habitat suitability under the combined effects of future climate and LULC change. Myanmar and Russia have introduced high and medium-suitable areas for the woolly wolf in future scenarios. Uzbekistan and Kazakhstan showed a consistent loss in the highly suitable area, while Mongolia and Bhutan had the highest gain in the suitable area. In addition, acquiring necessary permissions and radio collars for telemetry studies of Wolf, Pallas cat and Himalayan marmot is in process. Intensive study sites for all three species have been identified in Hanle, Changthang Wildlife Sanctuary. Capture protocol for all three species has been developed with detailed descriptions and has been handed over to Wildlife Department, Leh. The current progress report has been submitted to the Wildlife Warden, Leh. Radio collars for the marmot have been received.

Outputs and Outcomes

Future projections with respect to wolf distribution and habitat suitability under future climatic scenarios and LULC change have been modelled. The manuscript is published in Frontiers in Ecology and Evolution. Intensive study sites have been identified by on-field surveys. All three selected mammalian species have been sighted at the field sites. The progress report, along with the capture protocol for all three species, has been developed with a detailed description and has been handed over to Wildlife Department, Leh. Two workshops with locals have

been conducted to inform about project activities, from the ecology of species to methods of capture and radio-collaring. They have coordinated with us to help carry out field activities.

Milestones

A manuscript on Wooly Wolf distribution was published in Frontiers in Ecology and Evolution. A workshop with the local community for enhancing knowledge and understanding of the three species as well as local support was conducted in Hanle, Changthang. Capture and radio-collaring protocol has been described in detail and submitted along with a progress report to the Wildlife Department, Leh.

ECOLOGY AND RECOVERY OF CRITICALLY ENDANGERED VULTURE SPECIES IN PONG DAM PROTECTED AREA (PA) AND ITS ECO SENSITIVE ZONE (ESZ) IN DISTRICT KANGRA, HIMACHAL PRADESH

ONGOING PROJECT

Funding Source
R&D Project, MoEFCC

Investigators
Dr Gautam Talukdar and Dr R. Suresh Kumar

Researchers
Malyasri Bhattacharya and Ankit Zode

Date of Initiation
January 2020

Proposed Date of Completion
September 2023

Objectives

(i) To study movement ecology using satellite telemetry; (ii) Niche modelling of selected species of the vulture to study their distribution pattern; (iii) Prevalence of Diclofenac and their effects in the study area; and (iv) Capacity building of Himachal Pradesh State Forest Department.

Progress

During the reporting period, five White-Rumped Vultures have been captured and tagged with E-Obs Solar GPS-GSM tags weighing 55g. Wild White-rumped vultures have been tagged from natural feeding sites since August-October 2021. Few new

feeding stations governed by local authorities have been identified, and many nesting sites and roosting sites were also located. Threats to the vulture population have been identified in the study area. Collision due to the powerline near the feeding station and loss of nesting trees due to forest fire is also reported. The climatic niche of nine species of vultures has been modelled using SSP scenarios from 2041-2060 and 2061-80. The work documents the climatic niche suitability of vultures over its range on a global scale. Undercover pharmacy searches have conducted NSAID surveys in different parts of the Kangra district. Three capacity-building workshops have been arranged with HP Forest Department Staff. The workshops identified the importance of vultures, threats to nesting, feeding sites, and the methodology for population census in the study area

Outputs and Outcomes

The vultures are moving regularly between their nesting, roosting and feeding sites. The average distance travelled is 35 km per day. From the NSAID surveys, we have also found that the use of similar kinds of drugs, which are equally toxic to vultures, like Aceclofenac, Nimesulide, and Ketoprofen, is being widely used in the area. Many threats have also been recorded during the study, including forest fire, which imposes a serious risk to the nests of the White-Rumped vulture in the study area. Most feeding stations near power lines increase the risk of electrocution. Eleven Himalayan Griffon vultures and Two Egyptian Vultures were found dead due to electrocution in the powerline at nearby feeding stations. Threat to food availability as natural carcass dumping stations managed by locals is decreasing in the study area due to a decrease in the tanning and bone industry.

Milestones

A vulture awareness programme conducted with the Himachal Pradesh Forest Department sensitized forest officials about the need for vulture conservation and its importance in the study area. Workshops on breeding vulnures have sensitized people about the protection of vulture nests in the study area.

ASSESSING FINE SCALE DISTRIBUTION PATTERN, POPULATION AND HABITAT STATUS OF NORTHERN SWAMP DEER, *RUCERVUS DUVAUCELII DUVAUCELII* ACROSS UPPER GANGETIC PLAINS OF NORTH INDIA

ONGOING PROJECT

Funding Source
Ministry of Environment,Forest and Climate Change

Investigator
Dr Samrat Mondol

Researcher
Sohini Saha

Date of Initiation
November 2019

Proposed Date of Completion
September 2023

Objectives

The objectives of this project are to (i) assess the fine-scale distribution of swamp deer across its habitat in Uttarakhand and Uttar Pradesh through intensive ecological surveys; (ii) Mapping the distribution of grassland patches with swamp deer evidence along upper Ganga and its tributaries, along with evaluation of the extent of grassland usage by wildlife and identify suitable sites for grassland restoration; and (iii) Understanding swamp deer movement patterns by radio collaring selected male and female animals in upper Gangetic plains.

Progress

The first survey between Jhilmil Jheel Conservation Reserve (JJCR) and Hastinapur Wildlife Sanctuary (HWLS) showed evidence of swamp deer presence

with connectivity between these two areas. The survey also gave detailed information on the status of swamp deer habitat in Gangetic plains. In the recent pilot survey during January-June 2021, the team surveyed a 525km stretch of Ganga river from Garhmukteshwar to Kanpur, Uttar Pradesh, covering around 7,340.69 km^2 area across 13 districts (Bulandshahr, Amroha, Sambal, Aligarh, Budaun, Farrukhabad, Kashganj, Shahjahanpur, Kannuaj, Hardoi, Unnao, Kanpur Dehat and Kanpur Nagar) of Uttar Pradesh.

In the Ganga basin area, the research team used Google Earth imageries to identify grassland patches to corroborate with the information on swamp deer habitat provided by the local residents living close to river Ganga within the study area. The study was conducted on 8-9 km on both sides of the Ganga river. With the help of the GPS, the team collected coordinates on the periphery of the grassland patches. The team also collected biological samples in the form of antlers, pellets and opportunistic tissue samples from dead animals. Depending on the location and characteristics of the grassland habitat, the team surveyed on foot, by vehicle or by boat. The research team also recorded disturbance pressure around the grassland patches. The team divided the entire study area into four survey zones taking into account the presence of habitat patches, Forest Division and Ganga bridges: (i) Survey zone 1- from Garhmukteshwar to Sankara Ganga bridge covering four Forest Division (Bulandshahr and Aligarh on the right bank, Amroha and Sambal on the left bank); (ii) Survey zone 2- from south of the Sankara Ganga bridge to Farrukabad Ganga bridge which consists of four Forest Division (Kanganj on the right bank, Badaun and Shahjahanpur on the left bank and Farrukabad on both side of the Ganga river); (iii) Survey zone 3- from the south of Farrukabad bridge to Mehendighat bride on Kannauj-Hardoi road. This zone covers three Forest Divisions (a) part of Farrukabad Forest Division with Kannauj on the right side and Hardoi on the left side of the Ganga river); and (iv) Survey zone 4- from the end of the zone to Baksar Ganga bridge in Kanpur. This zone mainly comprises Kanpur Forest Division on the right side and the Unnao Forest division on the left.

In the Sharda basin, the research team conducted unstructured questionnaire surveys with locals in the non-protected areas along the Sharda river and identified the grassland patches and potential swamp deer habitat on both banks of the river Mala and Sharda covering both protected (Pilibhit Tiger Reserve, Kishanpur Wildlife Sanctuary) and non-protected (North Kheri Forest Division) areas. The Pilibhit Tiger Reserve (PTR) is divided into five ranges- Mohof, Mala, Deoria, Barahi and Haripur; Kishanpur Wildlife Sanctuary (KiWLS) has two ranges under it. The research team identified grassland patches from the Google Earth imageries and traversed the periphery of each patch on foot, tractor or boat to collect GPS points for ground turtling. The team collected antlers, pellets, and tissue samples from dead animals within the PTR, KiWLS, NKFD and other lesser-known habitat patches in the non-protected area of the study region. In March and April 2022, the team also conducted the survey in Dudhwa National Park (DTR) and Katarniaghat Wildlife Sanctuary (KWLS) and collected biological samples (antlers and opportunistic tissue samples from dead animals)

Outputs and Outcomes

Along the 525 km stretch of river Ganges between Garhmukteshwar to Kanpur (total area of ~73,4068.69 ha/~7340.69 km^2), only ~9921.29 ha (~99.22km^2) grassland area was recorded which represents only 1.3% of the total area. It corroborates the earlier MaxEnt prediction of low habitat suitability in this region. A total of 128 grassland patches were mapped with a mean patch size of ~80.94 ha (~0.8 km^2). The largest grassland patch size was about ~825.62 ha (~8.26 km^2), while the smallest patch size was about 2.37 ha (0.02 km^2). Zone 1 and zone 2 have only ~2% of grassland habitat (32.65 km^2 and 42.50 km^2 grassland area out of 1666.71 km^2 and of 2449.13 km^2 total area), whereas zone 3 and 4 have less than 1% of grassland habitat (8.61 km^2 and 15.44 km^2 grassland area out of 1071.41 km^2 and of 2153.23 km^2 total area)

Throughout the study area, the team found swamp deer (direct sighting, antlers and pellets) evidences only from nine grassland patches of zone 1 and 2 (between Bulandshahr to Farrukhabad). Out of which, six grassland patches are situated in survey zone 1 (Four grassland patches in Bulandshahr Forest Division and two grassland patches in Aligarh Forest Division), and three grassland patches present in survey zone 2 (one grassland patch in Badaun Forest Division and two grassland patches in Kasganj Forest Division). The bigger size patches (≤1 km^2) were mostly found between Bulandshahr to Farrukhabad (Zone 1 & 2).

As this entire study is human-dominated and less protected, habitat conversion and encroachment were found to be a major threat, as most of these grassland patches are interspersed with cropland. Livestock grazing is the second major disturbance in this landscape, as more than 1000 wild cattle regularly graze within these grassland patches. Extensive lopping, continuous land tilling, plantation

and sand mining are the other disturbances found during the survey.

First-time swamp deer direct sighting was recorded from the Alipur Bhakhri and Karimnagar Khadar area of Kasganj Forest Division. Grasslands occupy a fair proportion of Sharda habitat block nurtured with numerous small to moderate-sized waterbodies skirting them along with a mosaic of other habitats. The study recorded that 17% of the total study area falls under grasslands, signifying its great importance for barasinga conservation and a rich component of terai wilderness. The total number of grassland patches in the study area was 1,549 covering around ~23,738 ha (~237.38 km^2) under grassland.

As the Sharda habitat block is the stronghold of the northern swamp deer population, a good number of the direct sighting was recorded during the survey. Throughout the study area, the team found two carcasses, 116 antlers and 264 pellet samples. The majority of the sample was collected from Chugebi (Mohaf range), LagaBhaga and Fazullaganj (Barahi range) in PTR; Jhadi Tal and Ull river grassland (Kishanpur range) in KiWLS; Simra block (Sampuranagar range) and Allegunj (Bhira range) in NKFD.

Though habitat encroachment is high in buffer areas, the annual flooding of the Sharda river leads to the regeneration of dry grassland habitats (mainly consisting of Saccharum spontenum, Typha sp.) along the river bed. These grassland patches along river Sharda act as the stronghold of Swamp deer. The ranges (Deoria in PTR and Malani in NKFD) with more grassland patches eventually have a more fragmented patch with a smaller patch size. A majority of the grassland patches in the Deoria range are distributed at the boundaries of the forest area with the constant pressure of high livestock grazing, habitat encroachment and plantation, resulting in small patch sizes. This may be the probable reason for no swamp deer presence in this area.

Milestones

Grassland patches below Garhmukteshwar were identified. First-time swamp deer direct sighting was recorded from the Alipur Bhakhri and Karimnagar Khadar area of Kasganj Forest Division. Many new grassland patches with swamp deer locations were identified in the non-protected area along river Sardha. More than two hundred swamp deer were sighted in Haiderpur wetland near Bijnor Barrage.

ONGOING PROJECT

SECURING HABITATS FOR THREATENED MOUNTAIN UNGULATES THROUGH ROBUST POPULATION ASSESSMENT AND CONSERVATION PLANNING

Funding Source
Ministry of Environment,Forest and Climate Change

Investigators
Dr Vishnupriya Kolipakam, Shri Qamar Qureshi, Dr S. Sathyakumar, Dr Sutirtha Dutta, Dr Lallianpuii Kawlni, Dr Amit Kumar

Researchers
Himanshu Matta, Surojit Moitra and Tarun Singh

Date of Initiation
October 2020

Proposed Date of Completion
October 2023

Objectives

The objectives of this project are to (i) assess the population status of an ungulate mountain community in representative sub-tropical and temperate Himalayas of Arunachal Pradesh. (ii) understand the abundance, habitat relationship, genetic and health

status of threatened mountain ungulates of serow and goral.

Progress

Analysis of data collected previously from January to May 2021 was done. The research team obtained a density estimate of five ungulate species at the study site using the camera trap distance sampling method. Comparison between the two methods of density estimation, i.e. Random Encounter Modelling (REM) and camera trap distance sampling (CTDS), was done using wild boar as the model ungulate species.

The team deployed a total of 37 camera traps across all three ranges, i.e. Seijosa, Tippi and Rilloh of Pakke Tiger reserve (November 2021 – May 2022). (i) Relative Abundance Index (RAI) and species activity pattern estimation; (ii) Distance estimation from animal images of images captured using camera traps at field session; (iii) Standardization of Microsatellite primers; (iv) Standardization of DNA Extraction protocol for genetics; and (v) Extraction and quantification of DNA from faecal and blood samples for metagenomics analysis.

Outputs and Outcomes

The abundance of ungulates was estimated through distance sampling using 33 camera traps. The data from the camera trap was collected for five ungulate species, Sambar, Barking Deer, Gaur, Wild Boar and Hog Deer. The detections of all the species were good enough to fit the detection function and obtain a reliable density estimate, except for hog deer (n = 12).

The density of ungulate species from Pakke Tiger Reserve (camera traps = 33) per sq. km, based on camera trap-based distance estimation, and their corresponding number of observations, encounter rate, effective detection radius, chi-square, detection probability and model used for estimation. Encounter Rate= n/K, where K is the total effort calculated as the maximum capture event possible K= 14514740), GOF: Goodness of fit, SE: Standard Error

Species	No. of observations (n)	Encounter Rate(n/K)	Effective Detection Radius EDR	Chi Square GOF	Detection Probability (SE	Model	Density (per sq km) (SE)
Sambar	654	4.50576E-05 (9.35E-06)	5.9(0.72)	0.99	0.43(0.1)	Half Normal Cosine	3.30(0.68)
Barking Deer	965	6.64841E-05 (2.34E-05)	6.5(0.11)	0.97	0.48(0.01)	Hazard Rate Cosine	4.01(1.41)
Gaur	173	1.19189E-05 (4.19E-06)	4.2(0.33)	0.92	0.22(0.03)	Half Normal Cosine	1.72(0.61)
Wild Boar	214	1.47436E-05 (3.92E-06)	7.5(0.2)	0.96	0.71(0.05)	Hazard Rate Cosine	0.67(0.17)
Hog Deer	12	8.26746E-07	2.31(0.58)	0.72	0.14(0.07)	Half Normal	0.39(0.23)

Random Encounter Model (REM)

The density estimate for wild boar in Pakke Tiger Reserve using REM was found to be 0.74±0.22/ sq km.

Random Encounter model (REM) for wild boar, depicting trap rate, effective distance (in m), effective angle, activity level, speed and density based on data of 79 captures of wild pig from 33 camera traps, active for 1346 trap nights. SE = Standard Error, CV = Coefficient of variation and CI = Confidence interval. The speed estimate for the wild boar required for the analysis was borrowed from the REM study done in Corbett Tiger Reserve.

REM parameters	Estimate	SE	% CV	95% CI
Trap Rate	0.06	0.01	24.47	0.03
Effective Distance (m)	7.03	0.23	3.34	0.46
Effective Angle	0.49	0.07	14.34	0.14
Activity Level	0.40	0.05	12.87	0.10
Speed (m/s)	0.41	0.06	14.63	0.12
Density	0.74	0.22	28.90	0.43

33 Camera traps were active for a total of 1,789.13 trap nights. A vast number of species was observed at the study site, which includes 12 species of carnivores and seven species of herbivores

Milestone

Camera trap-based distance sampling estimates provide a more comprehensive insight into understanding mountain ungulate densities and distributions compared to traditional estimation methods. The random encounter model and CTDS did not differ in their precision.

ONGOING PROJECT

METAPOPULATION DYNAMICS OF TIGERS ACROSS THE TERAI-ARC LANDSCAPE, INDIA

Funding Source
Wildlife Conservation Trust-Panthera Global Cat Alliance

Investigator
Dr Samrat Mondol

Researcher
Suvankar Biswas

Date of Initiation
December 2014

Proposed Date of Completion
December 2023

Objectives

(i) The aim was to investigate the dynamics of the tiger metapopulation across the Terai-arc landscape by determining (a) the Spatial distribution of tigers in each of the eight protected areas, managed forests, and the corridors connecting them in this landscape, and assessing the source-sink dynamics among these habitats by estimating abundance, population density, sex ratio and dispersal directions among tiger populations; (b) Connectivity and dispersal rates among different tiger populations across the corridors, and what landscape features facilitate/hinder such movements; (c) Estimate genetic relatedness and population structure among the tiger populations, and their relationship to the habitat connectivity; (d) Conduct tiger population viability analysis at the metapopulation level integrating ecological, genetic and landscape level information collected over the study period. (ii)(a) Assess the food habit of tigers in different habitat types, *i.e.*, Shivalik-Bhabar and Terai of the Terai-Arc Landscape of India using non-invasive sampling; (b) Evaluate ecological variables that influence such patterns; and (c) Explore the patterns of livestock depredation by tiger across Terai-Arc Landscape, India.

Progress

Non-invasive samples were opportunistically collected across the 900 km long linear stretch of Terai-Arc Landscape (TAL), India, from November 2014 to December 2020. The samples were first genetically ascertained through tiger-specific molecular markers and then individually identified. Non-invasive genetic tools and GIS modelling tools were used to assess the tiger presence and population structure across TAL covering protected and non-protected habitats; population connectivity in terms of tiger source-sink population dynamics in TAL; and identify the critical corridors that help maintain the metapopulation dynamics.
enetically confirmed tiger-positive samples were also used to study the food habit. The sampled areas across TAL were stratified into different categories based on habitat types to comparatively ascertain any possible food habit differences. In each case, data on relative frequencies of occurrences (RFO), prey biomass and prey preference were calculated. To ascertain any relationship between tiger food

habits with ecological variables in Shivalik-Bhabar and Terai, a general linear model (GLM) was performed.

Finally, to visualize the overall prey species predation pattern by a tiger in Shivalik-Bhabar and Terai (species grouping in different habitats), Non-metric Multidimensional Scaling (NMDS) ordination was used. RFO, biomass and abundance of prey species in Shivalik-Bhabar and Terai habitats and their respective body weights were used as variables for the analysis. The Kernel density estimation (KDE) technique was used to assess the livestock predation hotspots across TAL.

Outputs and Outcomes

Genetic analyses with 219 individual tigers revealed three low, but significantly differentiated tiger subpopulations. Overall, the research team identified seven source and ten sink areas in TAL through genetic migrant and gene flow analyses. GIS modelling identified a total of 19 (10 high, three medium and six low conductance) corridors in this landscape, with ten being critical to maintaining landscape connectivity.

Food habit analysis was done through the morphological prey identification method. The RFO analyses revealed that tiger consumed mainly five large (sambar, swamp deer, nilgai, wild pig and chital) and five relatively small-bodied (hog deer, barking deer, primates, rodents and birds) wild ungulate species along with livestock (large-bodied domestic ungulate). These six large-bodied (wild and domestic) prey species comprised 93.7% of the tiger diet.
The GLM analyses indicate that both RFO and biomass have a significant positive relationship to prey abundance in Shivalik-Bhabar and Terai habitats. However, these two habitats showed contrasting relationship patterns with prey body weight, where no important relationship was seen between RFO and body weight in either of the habitats, but it was positively related to prey biomass in Terai.
Out of all the processed samples, ~10% of tiger faeces contained livestock evidence, primarily found in the Terai habitat (~87%). The KDE hotspot mapping corroborated this pattern where Amangarh TR, Terai West FD and the south-eastern boundary of Corbett TR were found as major livestock predation hotspots, and all of them are in the Terai habitat. This would be a major conservation concern in this landscape as such events often lead to human-tiger conflict. Careful management interventions in the form of better husbandry practices (stall feeding), reducing grazing pressure from inside PAs, adequate compensation programs in a timely manner etc., can reduce such conflict threats.

Milestones

The research team used a multidisciplinary approach to evaluate all tiger corridor functionalities at a landscape level across the TAL. To the best of our knowledge, this is the first study using genetic analyses and corridor modelling to understand tiger source-sink dynamics and connectivity at a landscape level in TAL. The results from TAL showed the existing corridors' functionality and pointed out critical areas where immediate conservation attention is needed. The team believed that a focused approach to addressing such concerns would improve the long-term sustainability of the tiger populations in TAL.

The first landscape-based study on the food habit of tigers in India, and it is believed that these results have wider relevance for appropriate tiger-centric conservation plans within this rapidly-changing human-dominated landscape.

ONGOING PROJECT

GENDER ADVANCEMENT FOR TRANSFORMING INSTITUTIONS (GATI)

Funding Source
Department of Science and Technology

Investigator
Dr Ruchi Badola

Researcher
Ritu Chauhan

Date of Initiation
August 2021

Proposed Date of Completion
January 2023

Objectives

The project has the following objectives (i) The GATI pilot project aims to develop and introduce the first gender equality frameworks within India's academic domain. (ii) GATI seeks to bring about institutional reforms to facilitate the intake, advancement and retention of women in STEM at all levels. (iii) Committing to the key principles of the GATI charter. (iv) Achieving gender equality and empowering women in the institutional climate. (v) Creating pathways to bring out transformative change. (vi) Institutionalise equity and inclusion through policies. (vii) Strengthen the National STI ecosystem.

Progress

Identification of existing data sources has been initiated. A data template to analyse the career progression of the researchers in the WII has been created, and data has been collected from various departments and projects of the Institution. Data from the last five years of all MSc and PhD programs have been compiled and analysed to evaluate the gender parity in the institution. Career progression data of over 400 candidates have been collected so far from various research projects and courses. As part of the GATI pilot project, the institution formed a GATI Self Assessment team (GSAT) with 37 members divided into six core groups, with adequate representation from faculty, scientists, researchers, PhD scholars, and support staff.

A GSAT orientation was conducted for a better understanding of the GATI framework. There has been a regular exchange of knowledge and information between the WII GATI team and other stakeholders, including the Department of science and technology (DST), the UK British council, the University of West Scotland, Think through consultancy etc. The research team received a baseline questionnaire from Think through consultancy commissioned by the British Council of India to evaluate the GATI project across all the institutions. A total of 32 forms were filled by faculty and researchers and were submitted to the consultancy. For better outreach, WII-GATI's presence is on various social media platforms, including Twitter, Facebook and Youtube.

Outputs and Outcomes

The preliminary data analysis of the MSc (Wildlife Science) course shows the following data trend of female percentage:

2015-2017	2017-2019	2019-2021
28.57%	52.63%	33.33%

The PhD enrollment data trend of female enrollment over the last five years:

2016-2017	2017-2018	2018-2019	2019-2020	2020-2021
63.16%	41.03%	46.43%	53.85%	41.67

According to the currently available data of 206 Researchers, the female percentage stands at 42.23% in WII.

Milestone

Online web portal of WII GATI was integrated with the Department of Science and Technology GATI portal: https://gati.dst.gov.in/

ONGOING PROJECT

HABITAT IMPROVEMENT AND CONSERVATION BREEDING OF GREAT INDIAN BUSTARD

Funding Source
National CAMPA Authority

Investigators
Dr Yadvendradev Jhala, Dr Sutirtha Dutta, Shri Qamar Qureshi and Dr Vishnupriya Kolipakam

Researchers
Dr Shravan Singh Rathore, Dr Tushna Karkaria, Bipin CM, Vineet Singh, Srinivas Yellapu, Pravesh Sakhlani,Mohib Uddin, Sourav Supakar, Tanya Gupta,Devendra Dutta Pandey, Vishal Varma, Hrishika Sharma, Hemlata Joshi, Indranil Paul, Anjali Nagar and Varun Kher

Date of Initiation
March 2016 (2021 and No cost extension till 2023)

Proposed Date of Completion
December 2023

Objectives

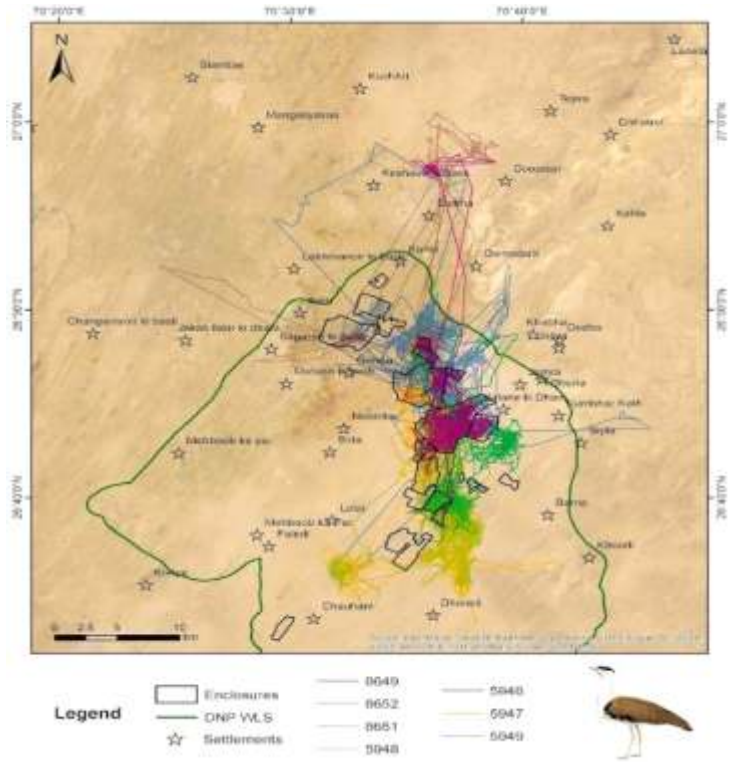
The objectives of the project are (i) conservation breeding: to secure ex-situ populations of Great Indian Bustard (GIB) and (if needed) Lesser Florican (LF); (ii) applied Research: (a) prioritise areas for conservation, (b) threat characterisation, (c) population and habitat monitoring for assessment of management effectiveness, (d) understand livelihood issues; and (e) understand population genetics to inform conservation management; (iii) capacity Building: creating awareness and advocacy to a) improve protection, b) sensitise stakeholders and decision-makers on bustard conservation, c) raise public awareness, and d) incentivise bustard-friendly land uses; and (iv) pilot Habitat Management: to demonstrate good practices through experimental interventions that can be replicated by the State Forest Department and other conservation agencies.

Progress

Conservation breeding: The project is implementing conservation breeding of great Indian bustards (GIB) and lesser florican (LF). The project presently runs breeding centres at Sam, Jaisalmer for GIB and at Bijainagar, Ajmer for LF. These facilities house 16 GIB in Sam, and 2 LF chicks in Bijainagar. The construction of long term conservation breeding centre in Ramdevra is 75% complete and is expected to be functional before the next breeding season.

Applied Research: Three female GIB were tagged in 2021-22 in the Desert National Park, bringing the total number of tagged birds to eight in Rajasthan and two in Gujarat since the Project commencement. All tagged birds were regularly ground-tracked and monitored. Data from tagged birds are revealing hitherto unknown ecological insights that are refining conservation strategies

Six LF males were tagged since the Project commenced. All birds were trapped with the help of nylon noose traps laid in agricultural fields where they were likely to use for breeding displays or crosses. Captured birds were fitted with Milsar S-9 GSM solar-powered lightweight tags, which transmitted locations



via a cellular network. The tagged floricans were ground tracked, and habitat features like land cover, terrain, vegetation composition, arthropod, disturbances and visibility were quantified at the used locations of the Birds to understand their seasonal site selection criteria.

Six out of seven tagged GIB laid eggs in the breeding season of 2021 (ranging from one to five re-lays in case the egg was lost/predated/collected), of which, only 26% of eggs left in the wild hatched due to the compounded effects of infertility / early embryonic death and predation. A chick recruitment survey was conducted in October 2021 to quantify the first quarter juvenile recruitment rate at the DNP by quantifying the chick-to-female ratio. Twelve adult females were detected, out of which four had a chick with them. Behavioural observations were conducted to understand the activity, foraging and breeding behaviour of GIB, along with habitat assessment of nest sites and areas used by tagged birds from the satellite-telemetry data.

In February 2021, a wildlife survey was conducted in the Bikaner district of western Rajasthan as requested by the Hon'ble Member of Parliament. The data was analysed and summarised from April 2021 to February 2022 and disseminated as the Bikaner survey report (status of migratory birds and key wildlife in Bikaner district, Rajasthan). 12,816 sq km area was extensively surveyed using the vehicle transect method along unpaved roads or dirt trails in slow-moving vehicles. Data on iconic native fauna (chinkara, foxes, bustards, cranes and raptors) and key neobiota (dog, pig and nilgai) were collected. Information on small birds, habitat characteristics and anthropogenic disturbances was recorded at regularly placed transect stop-over points (802 points). Major avian congregations or 'hotspots' (carcass dump at Jodbeed, wetlands and lakes at Gajner, Lunkaransar, RD507 and RD750) were surveyed. Based on the survey, recommendations were made for the conservation of wildlife in the landscape, and certain areas were prioritised for management. The survey also provided baseline information on the region's wildlife status.

Bengal florican habitats were visited in Assam and Arunachal Pradesh in March 2022. A total of 17 Bengal floricans were seen – 15 in Manas NP, 1 in Orang NP and 1 in D'Ering Memorial Wildlife Sanctuary. Bird carcass surveys were carried out to assess bird mortalities caused due to wind turbines and associated power lines in Thar, Jaisalmer. A dog count survey was conducted in 2021 in 25 settlements in collaboration with the Wildlife Conservation Society (WCS). In 25 settlements, 840 free-ranging dogs were recorded, comprising 667 breeding adults, 55 sterile (from a sterilisation drive conducted in 2019-20), and 118 pups.

Genomic analysis was carried out by generating a reference genome of GIB and re-sequencing two more individuals to help in the conservation management of the species. Arthropod count, the principal food of GIB, was quantified within and outside enclosures of Desert National Park. A study on spider community composition was also carried out to investigate if GIB-centric habitat management (specifically fenced grassland/enclosures to reduce

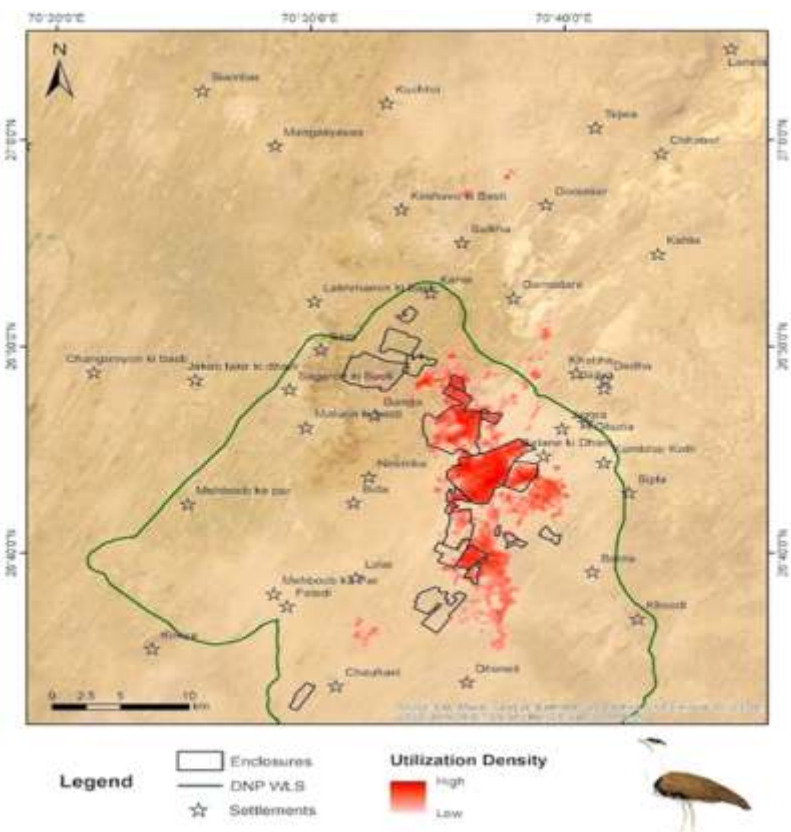
livestock grazing) benefits invertebrate assemblages that act as one of the primary foods for GIB. 11 pairs of enclosures and surrounding areas were surveyed. A total of 4,032 spiders were found belonging to 22 families. Habitat use and behaviour of Chinkara, *Gazelle bennetti* found in diverse land-use types of Thar Desert were studied in DNP and in some immediately adjoining unprotected areas outside DNP. Distance sampling method was used in two seasons- monsoon (July 2021 - October 2021) and winter (November 2021 – February 2022) to estimate Chinkara density across land-use types. 84 km was surveyed using 42 line transects in the monsoon season, and 90 km was surveyed using 45 line transects in the winter season. Chinkara was found foraging most of the time, followed by vigilance, walking, resting, and others activities.

Spiny-tailed lizards, *Saara hardwickii* use of burrows to thermoregulate was investigated using a combination of field and laboratory data, and the impact of climate warming on its locomotor performance and hours of activity in the future was evaluated. Currently, the lizards are restricted to their burrows for 6 hours during their active period. The model in this study predicted that by the year 2100, the lizards might get restricted to their burrows for 7 hours in the best-case scenario and for 9 hours in the worst-case scenario.

Pilot habitat management : Power lines are a leading cause of mortality for all big bustards, including GIB, due to their poor frontal vision and fast, heavy flights. According to population viability analysis, GIB can persist if power-line-induced mortality is curbed, requiring undergrounding high-risk power lines and installing Bird Flight Diverters on low-risk power lines. The Hon'ble National Green Tribunal (OA 385/2019 dated 23.12.2020) had ordered the installation of Bird Flight Diverters on all existing lines in the GIB Priority area and disallowed future lines in this area. Subsequently, the Hon'ble Supreme Court (WP (C) 838 of 2019, dated 19th April 2021) ordered for undergrounding of all power lines in the GIB Priority and Potential area and directed power agencies to install diverters on these lines within 12 months until they are undergrounded.

Bird diverters designed based on the project team's technical inputs to local vendors for manufacturing indigenous low-cost bird diverters were procured and distributed to powerline companies for installation. Long-term studies are ongoing to examine their field longevity and efficacy. Since the prevailing nest predation rates were high, trapping and translocation of nest predators such as free-ranging dogs, foxes, and monitor lizards were carried out by the team in breeding enclosures of Jaisalmer. The research team relocated the captured predators at a considerable distance outside the enclosures. Till now, 213 free-ranging dogs, two foxes and five monitor lizards have been removed.

After consultation with Rajasthan Forest Department, surveys were carried out to identify fence breaks in Sudasari and RKVY enclosures. These fence breaks



were repaired between July and August 2021, when the recruitment of chicks was high. RFD has initiated the extension of enclosures in the year 2021. New extensions have been made for RKVY and Gajaimata enclosures. For regeneration monitoring in these areas, camera traps were deployed (January 2022) to check for the movement of animals, including GIB.

Mapping of the grasslands in the country is being carried out to find suitable GIB and LF habitats and for future conservation planning.

Capacity Building and Outreach: (i) Training of field staff of Desert National Park in bird identification & training of forest staff and wildlife enthusiasts on wildlife assessment techniques . (ii) (ii) Interactive sessions with school children in/around Desert National Park in collaboration with the Rajasthan Forest Department during the Wildlife Week celebration. (iii) Residents of local villages in and around Desert National Park were briefed about the ongoing project activities in multiple meetings. (iv) Meetings with power agencies, regulatory bodies & technical advice to the Ministry of Environment, Forest and Climate Change regarding power-line mitigation for GIB conservation in matters related to court cases. (v) Publications (peer-reviewed papers, reports, dissertations).

Milestones

Establishment of specialised bustard conservation breeding centres in Jaisalmer and Ajmer, Rajasthan that house founder populations of 16 GIB and 2 LF, secured from wild-collected artificially-hatched and hand-raised chicks since 2019

Telemetry of 8 GIB and 6 LF providing crucial ecological and conservation insights that are helping in refining conservation plans for these species since 2017

Science-based prioritisation of important GIB habitats in Rajasthan and Gujarat, recommendations of mitigating power-lines (critical current threat for GIB) therein, and sensitization of line agencies have led to the implementation of these conservation measures as directed by the Hon. SC and NGT orders

Management of GIB egg/chick predators in critical GIB habitats, with sterilization of 800 free-ranging dogs and translocation of another 213 dogs from breeding enclosures since 2018.

ONGOING PROJECT

NICHE SELECTION AND MESOPREDATOR RELEASE IN HIGH ALTITUDE ECOSYSTEMS

Funding Source
Science and Engineering Research Board (SERB), Department of Science Technology (DST)

Investigator
Dr Salvador Lyngdoh

Researcher
Priyanka Justa

Date of Initiation
February 2021

Proposed Date of Completion
February 2024

Objectives

The objectives of the project are to (i) determine resource utilization by high-altitude carnivores; and (ii) What is the resource use of snow leopards, Himalayan wolves, foxes and free-ranging dogs in the trans-Himalayan region? (iii) investigate levels of overlap and influence by high altitude carnivores in terms of mesopredator release or suppression; (2.1) How do interactions amongst intra-guild predators influence top-down effects in terms of mesopredator

relative abundance and distribution? (2.2) How do bottom-up processes such as resource availability influence mesopredator release among the carnivore guild?

Progress

Literature review, Reconnaissance surveys and site selection were made during the reporting period. Camera trapping was carried out at four selected Spiti Valley, Himachal Pradesh sites. Scats were collected for diet analysis. Data analysis and Report writing were also done during the reporting period.

Outputs and Outcomes

The relative abundances and/or densities of apex predators, mesopredators, and prey in the region were determined using camera-trap data. Spatial and temporal niche segregation of snow leopards, Himalayan wolves, foxes and free-ranging dogs was examined along with the site occupancy of these species. Dietary niche overlaps were calculated to determine the extent of competition for prey between these carnivores. The study found that the carnivores in study areas, wherever they coexist, do so either by dietary or spatiotemporal segregation, stipulating competition for the limited resources. Preliminary findings of the study demonstrated the role of apex predators in regulating the abundance, distribution, and behaviour of mesopredators through intra-guild interactions.

The study also highlighted the role of resource availability and anthropogenic influences in determining the distribution and abundance of mesopredators.

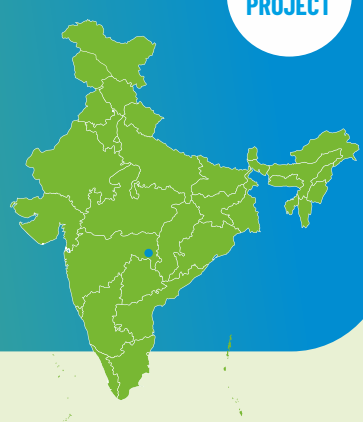
Milestones

The competitive dynamics of the two meso-carnivores, *i.e.* dogs, *Canis lupus* familiaris and red foxes, *Vulpes vulpes*, as well as their intra-guild interactions with the Spiti valley's top-carnivores, *i.e.*, snow leopard, *Panthera uncia* and Himalayan wolf, *Canis lupus chanco*, is little understood in the region and initial findings of the study fill this research gap.

A research paper titled 'Do top predators suppress mesopredators? Investigating carnivore intra-guild interactions in a trans-Himalayan landscape' was submitted to the journal 'Ecology and Evolution', including the research project's findings.

UNDERSTANDING POPULATION DYNAMICS, SPACE USE, MOVEMENT AND DIET OF LEOPARDS IN JUNNAR TALUKA, MAHARASHTRA FOR HUMAN LEOPARD CONFLICT MITIGATION

ONGOING PROJECT



Funding Source
Maharashtra Forest Department

Investigators
Dr Bilal Habib, Dr Parag Nigam and Dr Samrat Mondal

Researchers
Kumar Ankit and Rucha Ghanekar

Date of Initiation
April 2019

Proposed Date of Completion
April 2024

Objectives

(A) ***Population estimation:*** To estimate the density, abundance and demographic structure of leopards in Junnar Forest Division. (B) *Food habits of leopards:* To assess the food habits of the leopard through Scat analysis. Genetic database of the leopards: (i) to identify the family lineage of the serial offenders in the conflict cases, and (ii) To identify the population dynamics and sex ratio. (C) *Spatio-temporal use and movement pattern:* (i) To estimate the home range, space use, and territorial behaviour of individuals; and (ii) To study the dispersal pattern and habitat use of leopards dwelling in the human-dominated

landscape of Junnar Forest Division. (D) *Characterizing conflict sites*: To characterize the conflict sites based on the conflict scenario. (E) *Socio-economic survey:* (i) to evaluate the dependency of local people on forest resources; and (ii) To evaluate the magnitude of the conflict.

Progress

The camera trap exercise was replicated a third time again in Shirur *taluka* in February 2022 to understand the persistence of the carnivore in the landscape. Two more blocks of camera trapping exercise were added in the study area. All the data is being processed for sorting and analysed. To date, the team completed five blocks of camera trapping and three replications of one camera trap block.

Seven leopards were captured and fitted with satellite drop-off collars from the Junnar Forest Division between August 2021 to March 2022. A total of 10 Leopards (five male and five female) were radio-collared, and three collars were dropped off. Data analysis is in progress. Collared leopards are being tracked in the field. GIS-based data is used to analyze home range and space use and understand microhabitats' needs- infrastructure development, crop cover height, and crop area of crops/plantations taken refuge by leopards in the landscape. For diet analysis and genetic component, opportunistic scats collections were done across talukas and ranged under Junnar Forest Division. Periodic training (n=7) of forest officer/field staff members across ranges about camera trap exercises, ground-level observations, and leopard-rescue data collection. More than 70 staff members of different ranges were trained in this training. The targeted Officers/staffs were Ranger, Forester, Forest Guard and Beat Guards.

Outputs and Outcomes

In-depth interviews were designed to understand human attitudes and perceptions towards wild animals in their vicinity, which are currently being conducted. More than 120 Interviews were conducted across the study area, and data analysis is in progress. During the year, the research team also conducted more (n=13) camera trapping to help the forest department to track the leopards involved in human attacks, other human-leopard negative interactions and cub reunion cases. With the permission of the Forest Department, different non-lethal deterrents were tried in Manikdoh Leopard Rescue Centre, Junnar, to understand the efficacy of the designed deterrents.

Milestone

The research team presented the outcomes of the report in the Maharashtra Annual Research Seminar on 23 September 2021.

ONGOING PROJECT

LANDSCAPE SCALE ASSESSMENT OF HABITAT, POPULATION AND GENETIC STRUCTURE OF HISPID HARE *CAPROLAGUS HISPIDUS* IN THE HIGHLY FRAGMENTED TERAI GRASSLAND OF INDIA

Funding Source
DST-SERB, Duleep Matthai Nature Conservation Fellowship Programme, Prakrirti Research Fellowship

Investigators
Dr Sutirtha Dutta and Dr Vishnupriya Kolipakam

Researcher
Anukul Nath

Date of Initiation
May 2020

Proposed Date of Completion
May 2024

Objective

The project has the following objectives (i) Understanding the site occupancy and habitat relationships of hispid hare across its distribution range in India; (ii) Implementation of a refined population assessment method by integrating sign-based and individual identification-based approaches to estimate hispid hare abundance; and (iii) Understanding the population genetic structure of hispid hare within the distribution range in India.

Progress

Data collection on distribution, habitat occupancy, and density of hispid hare was completed for Manas National Park, Manas Reserve Forest, Barnadi Wildlife Sanctuary (Assam), D'Ering Memorial Wildlife Sanctuary (Arunachal Pradesh), Jaldapara National Park (West Bengal), Dudhwa National Park and Katarniaghat Wildlife Sanctuary (Uttar Pradesh). The dataset was collected using an occupancy framework in a systematic grid (2×2 km) design in the grassland areas. Species' detection/non-detection data was generated by recording pellet groups along segments of trails (spatial surveys) to achieve adequate spatial coverage. The pellets of Hispid hare were distinguished on the basis of their size and shape. In each grid, a 0.5-2.5 km area was surveyed for the pellets of hispid hare with the help of two independent persons following MRDS (Mark-recapture distance sampling approach). Subsequently, fresh pellets were marked on the site of observation, and two-four weeks intervals and the status of the rate of decay was recorded. DNA was extracted from the fresh pellets collected from different study sites, and analysis on progress. Furthermore, the research team has selected a (1.5×1.5) km grassland plot in the Bansbari range of Manas National Park and carried out intensive pellet sampling to systematically distribute the sampling effort and to avoid "spatial holes", and further divided this plot into 50×50 m (0.5 ha) sampling units. Fresh pellet samples were collected from each of these 0.5 ha plots, and genetic analysis is currently underway.

Outputs and Outcomes

The presence of Hispid Hare was recorded from Manas NP, Manas RF, Jaldapara NP, and Dudhwa NP. Hispid hare pellets were frequent in the Bansbari and Bhuyanpara ranges of Manas National Park compared to Panbari Range and adjoining Manas Reserve Forest. The pellets of a hispid hare were encountered in >90 % of surveyed grids in Manas, and over 5,000 pellet groups were encountered. The large encounter rate of the pellets is associated with a slow decay process. The pellet decay experiment showed that pellets placed in natural conditions decayed faster than pellets kept in caged conditions. In addition, fresh pellets marked in winter decayed faster than the pellets marked in the pre-winter season. In different grass cover classes, the number of pellets remaining after 80 days was highly variable. The majority of the fresh pellets were encountered in

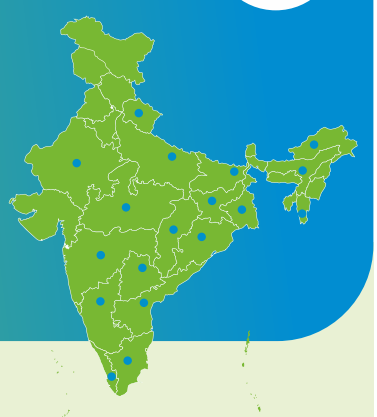
areas with grass heights above two meters. Although the species is elusive and nocturnal, it was sighted thrice in the Banasbari range of Manas NP and the Kodalbasti area of Jaldapara NP. The study also recorded extensive proliferation of *Chromolaena* odorata and *Mikania micrantha* in the grassland of Manas. No sign of hispid hare was found in Barnadi WLS, D'Ering Memorial WLS and Katarniaghat WLS. It was also observed that the small patches of riverine grasslands of Barnadi southern boundary area of D'Ering and grassland patches of Katarniaghat WLS were highly threatened by cattle grazing. In addition, awareness and outreach programmes, on the other hand, has so far included schools, the forest department, non-governmental organizations, and tourist lodges. Through ten awareness programmes involving over 40 teachers, 300 students, and 30 local youths, more than 400 forest officials and locals were made aware of the importance of hispid hare and grassland habitat. Painting competitions were held on the outskirts of Manas' landscape, and an information poster titled "SAVE OUR RARE HARE!!!" was created and distributed to students and other stakeholders.

Milestones

Using a non-invasive and sign-based survey, a scientifically credible system for monitoring the elusive endangered Hispid hare has been developed. The complete pellet decay rate of Hispid hare was studied for the first time under natural and controlled conditions. The designed molecular technique successfully extracted DNA from pellets. The ongoing implementation of education and outreach programmes has helped to educate local communities about natural resource management. Furthermore, through consultation with locals, able to locate several snares on the southern boundary of Manas National Park.

ONGOING PROJECT

MSTrIPES: MONITORING SYSTEM FOR TIGERS: INTENSIVE PROTECTION AND ECOLOGICAL STATUS



Funding Source
National Tiger Conservation Authority

Investigators
Shri Qamar Qureshi and Dr Y.V. Jhala

Researchers
Anup Kumar Pradhan, Ashish Prasad, Deb Ranjan Laha, Krishna Mishra, Kainat Latafat, Kesab Gogoi, Dhruv Jain, Rutu Prajapati, Manish Singanjude, Nanka Lakra

Date of Initiation
March 2012

Proposed Date of Completion
July 2024

Objectives

The project objectives are: (i) Updating MSTrIPES apps with changing Android versions and Google policies; (ii) Developing desktop software using an advanced database to accommodate big data; (iii) Developing cloud-based camera trap image recognition software to assist phase IV and country-wide monitoring; (iv) Developing web-analytics for

online report for multi-scale data; (v) Developing apps and desktop version for ecological sampling in Mangrove/ Riparian habitat; (vi) Training and hand-holding of frontline staff of Tiger Reserves for implementing MSTrIPES; (vii) Developing user guides, reports, articles, media reports, website etc. on MSTrIPES; and (viii) Developing mirror database server at NTCA and WII.

Progress

After successfully completing phase II (2016-2021) of the program, Phase III of MSTrIPES was developed and initiated with continued support from NTCA, wherein the program will be transferred to a faster and smarter programming environment of PostgreSQL, PostGIS and participatory GIS cloud. In the last year, 12 versions of the mobile apps were released to accommodate the changing android and google environment, as well as field requirements. A total of 5 regional level workshops and 33 site-specific training along with online handholding, were organized. Assistance was provided to MSTrIPES users for the ecology module across the country. Due to the ongoing pandemic situation, online training of the MSTrIPES desktop software has been provided to the technical staff, computer operators, data entry operators, biologists, and researchers of all the tiger range states of the country through video conferencing and remote desktop access. A total of ~966 participants from all the range states have been provided with the following inputs during the online workshops: (i) Demonstration and installation of MSTrIPES desktop software and fixing/ checking of basic issues; (ii) Online and offline import of GIS shape file for concerned forest divisions in the desktop software; (iii) Preparation and archiving of offline maps for further use in mobile applications; (iv) Import of ecological/ polygon search mobile backup data collected during field survey into the desktop software; (v) Visualization and export of the imported data; (vi) Data backup in the desktop software for submission to the Nodal Officers and National Tiger Conservation Authority.

Besides, the research team has provided offline training coordinated with the States and provided scientific and technical inputs to conduct Phase I & Phase III/IV surveys in all potential tiger habitats of tiger range states of the country, including Goa and Nagaland.

Outputs and Outcomes

MSTrIPES ecology desktop module was used to check and analyze the Phase-I data for all India Tiger Estimation exercise 2021-22. Apart from this, MSTrIPES monthly reports of the Patrol module from 34 tiger reserves were obtained in the period. On average, 861,275 (±5,350) km of monthly patrols were recorded across the tiger reserves. Many tiger reserves (*e.g.*, Amarabad, Similipal, Kanha, Tadoba, Dudhwa) had more than 70% patrol coverage of the reserve, and many reserves had patrols spread across the day and night period (*e.g.*, Similipal Tiger Reserve had around 2,500 km patrolling every month between 9:00 pm to 5:00 am). The team developed mobile apps from the phase III of MSTrIPES with the latest technological updates.

Milestones

MSTrIPES provided a comprehensive graph of the conservation-related investment at a national scale during the monthly patrolling. A new photo-analysis module was launched as part of the MSTrIPES desktop, which uses machine learning and statistical libraries to automatically segregate camera trap photographs and estimate species distribution, occupancy, activity pattern and diversity indices. This tool was used for the report on the status and distribution of important mammals in India. As a result of user-friendly apps, the program has been absorbed by many other states and researchers for a landscape surveys and patrolling (*e.g.* Union Territory of Ladakh used MSTrIPES for landscape-scale snow-leopard assessment to record ~6000 km foot surveys). MSTrIPES phase II was completed, and all mobile apps, desktop software, codes, and reports were delivered to the NTCA.

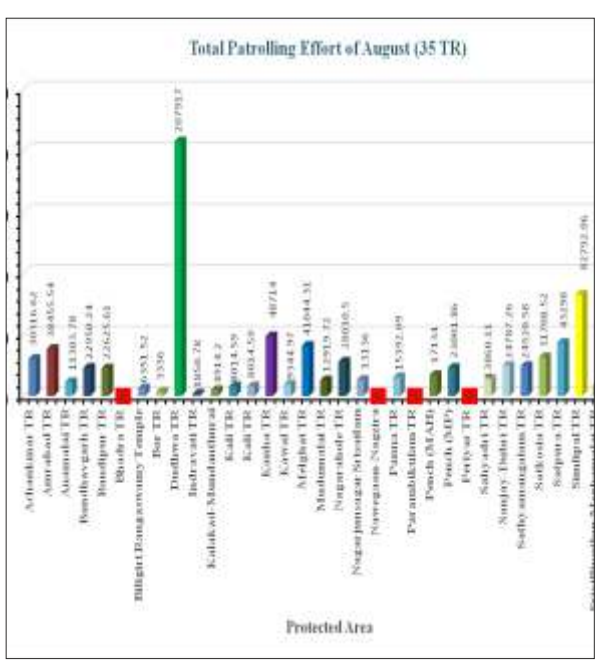


Figure 1 Monthly patrolling: Patrolling efforts invested by other tiger reserves during the August months using the MSTrIPES program. (Source: https://docs.google.com/spreadsheets/d/19kAH0nxxSkxGnQnloNHLTk9jwibs4ocAIjY1InaTAic/edit#gid=0)

BRINGING BACK THE CHEETAH TO INDIA

ONGOING PROJECT

Funding Source
Ministry of Environment, Forest & Climate Change through National Tiger Conservation Authority

Investigators
Dr Bilal Habib, Dr Parag Nigam and Dr Samrat Mondal

Researchers
Bipin CM, Parul Sen,Moulik Sarkar, Sultan, Kathan Bandopadhyay, Harshini Jhala, Nupur Rautela, Akshay Jain, Kesha Patel, Shantanu Sharma, Ankita Sharma, Manish Singanjude, Pooja Choudhary, Monika Saraswat and Srigan Moharir

Date of Initiation
November 2020

Proposed Date of Completion
November 2025

Objectives

The project aims to establish multiple breeding populations of cheetahs at selected sites in partnership with the National Tiger Conservation Authority; Ministry of Environment, Forest and Climate Change; and State Forest Departments (Madhya Pradesh and Rajasthan initially). This included reassessing the potential priority sites identified by Ranjitsinh & Jhala (2010) and assessing new sites that meet the criteria of inviolate space, prey availability, historical occurrence and local community acceptance. Based on the site assessment, making/refining site-specific recommendations in terms of the site's potential for cheetah release, the long-term strategy, commitment and refinement of costs involved in successfully attempting to establish viable cheetah populations in India. Simultaneously (i) sourcing and transport of cheetah to India; (ii) soft or hard release at appropriate sites; (iii) monitoring and research of the introduced individuals, populations and ecosystems; (iv) management of the release sites for (a) habitat, (b) prey, (c) protection, (d) potential livestock-cheetah conflict, (e) community participation and livelihoods, (f) managed metapopulation within India and supplementation from sources for genetic diversity and demographic process.

Progress

As proposed by the State Governments of Madhya Pradesh (MP) and Rajasthan, on the directions of the Hon. Supreme Court appointed Expert Committee on Cheetah introduction and NTCA, assessments were carried out at (i) Kuno National Park (NP), (ii) Madhav NP, (iii) Gandhi Sagar Wildlife Sanctuary (WLS) and (iv) Nauradehi WLS in Madhya Pradesh, and (v) Mukundara Hills Tiger Reserve (TR), (vi) Shergarh WLS, and (vii) Bhainsrodhgarh WLS in Rajasthan, for potential cheetah release sites in March-May 2021. Cheetah metapopulation expert from South Africa, Mr Vincent van der Merwe, visited Kuno NP, Mukundara TR and Gandhi Sagar WLS with the WII team and held discussions with officials of the NTCA, State Forest Departments of MP and Rajasthan for translocating cheetah to India. Mr van der Merwe submitted the site evaluation report with recommendations to the NTCA, and members of the Hon'ble Supreme Court appointed Expert Committee, and subsequently, preparations for the soft release of cheetah were initiated in Kuno NP. Based on the design of the electrified predator-proof soft-release enclosure in Kuno provided by the WII in consultation with South African cheetah experts, the construction was carried out by MP Forest Department. As a follow-up to the decisions taken during the sixth meeting of the Expert Committee held in September 2021, a site visit was carried out to inspect the progress of the construction of the soft release enclosure for holding cheetah and other preparations in Kuno NP by Dr Y.V. Jhala and Mr Bipin C.M. from the WII during December 2021 and a report on the cheetah soft release enclosure and other aspects for

preparedness for bringing cheetah to Kuno NP was submitted to NTCA and MP Forest Department.

Based on the site assessments and with inputs from various experts, an Action plan for introduction of cheetahs in India in accordance with the latest IUCN guidelines (IUCN 2013) for reintroductions and conservation translocations was jointly prepared by the WII, NTCA and MP State Forest Department. The Action plan for the introduction of cheetahs in India is prepared based on the latest IUCN guidelines to ensure the population viability of translocated cheetahs in India in a metapopulation framework. As part of monitoring prey populations in Kuno NP as prescribed in the action plan for the introduction of cheetah in India, a study on the ecology of the four-horned antelope, classified as a vulnerable species according to IUCN red list and Schedule I species under the Wild Life (Protection) Act of India,1972 is being carried out in Kuno NP.

The first official delegation from the Government of India comprising of officials *viz.*, Inspector General – NTCA, Deputy Inspector General (Wildlife) MoEFCC, Chief Wildlife Warden, MP, Secretary, Environment and Forest, MP and Dean, (lead project scientist- Dr Y.V. Jhala), WII visited Namibia in February 2022 and held bilateral talks regarding modalities of sourcing cheetah from Namibia in consultation with the Namibian Authorities from project collaborator Cheetah Conservation Fund (CCF) and other Parks in Namibia for relocation into their historical range and wild habitat in India. The delegation held G2G-level talks with the Namibian officials. The comprehensive Action Plan document drawn up by India was also handed over, elaborating on the protocols and safeguards taken into account while the process of translocation of Cheetah is done. Further, the preparedness in the field to receive cheetahs in India was also highlighted briefly at the outset. The delegation visited the CCF facility and held scientific and technical discussions regarding the project. The scope of engagement between the Governments of India and Namibia through a Memorandum of Understanding (MoU) on cheetah and biodiversity conservation was also discussed and agreed that this was very important to shape the way forward. Further, a draft MoU was jointly prepared by the Government of Namibia and the Government of India and shared with various Government ministries/ agencies in the respective countries.

Outputs and Outcomes

The comprehensive action plan for the introduction of cheetahs in India in accordance with the latest IUCN guidelines (IUCN 2013) for reintroductions and conservation translocations was released by the Hon'ble Minister of Environment, Forest and Climate Change, Shri Bhupendra Yadav in January 2022. Kuno NP has been chosen as the first site for the cheetah introduction since it is ready with the required level of protection, prey, and habitat to house the cheetahs. Kuno NP was estimated to have a current capacity to sustain 21 cheetahs. Once a cheetah population establishes itself within Kuno NP, dispersers would colonize the landscape and potentially hold 36 individuals. Once a cheetah population is established in Kuno NP, reintroduction of the lion or colonization by tigers would not be detrimental for cheetah persistence. Kuno offers the prospect of housing four large felids of India - tiger, lion, leopard and cheetah to coexist as they did in the past. Simultaneously, restorative investments in other selected areas (Nauradehi and Gandhi Sagar Protected Areas) have commenced in the form of incentivized voluntary relocation of human settlements, prey supplementation, and habitat management through weed removal and livestock grazing control.

Milestones

For the first time in India, the only large carnivore-cheetah to go extinct in the country's recent history is being brought back so as to (1) recolonize its historical range, (2) perform their ecological role in restoration of savannah-woodland system and (3) serve as a flagship and umbrella species for the conservation of underrepresented and badly neglected grassland/ open forest ecosystems in the country.

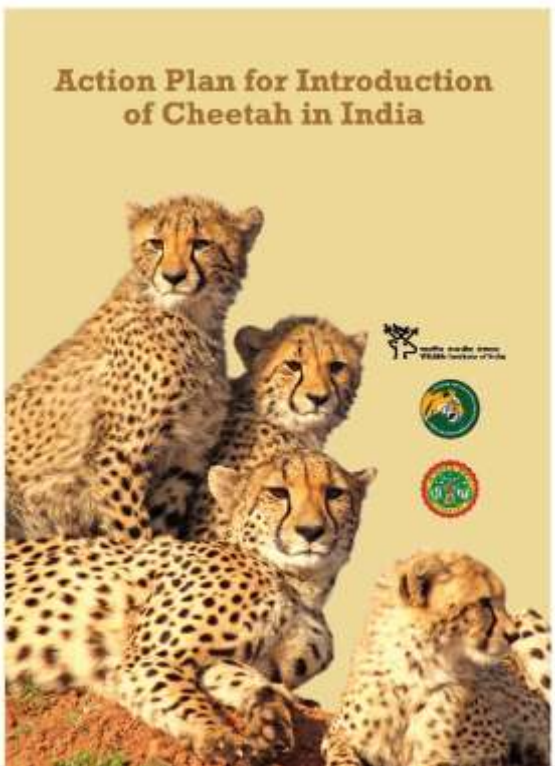
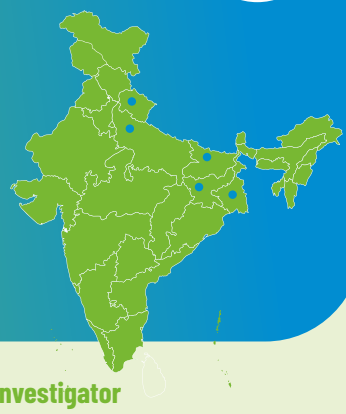


Image 1. Action Plan for the introduction of Cheetahs in India

PLANNING AND MANAGEMENT FOR AQUATIC SPECIES CONSERVATION AND MAINTENANCE OF ECOSYSTEM SERVICES IN THE GANGA RIVER BASIN FOR A CLEAN GANGA

Ongoing Project



Funding Source
National Mission for Clean Ganga, Ministry of Jal Shakti

Investigator
Dr Ruchi Badola

Researchers
64 research personnel

Date of Initiation
January 2020

Proposed Date of Completion
December 2025

Objectives

The project has the following objectives (i) Strengthen the aquatic biodiversity conservation measures at six identified biodiversity hotspots along the Ganga River and monitor status of other areas; (ii) Explore the natural and assisted colonization of species of conservation significance to other stretches of mainstream Ganga River. (iii) Determine the current state of aquatic environment and biodiversity of the major tributaries and wetlands in Ganga basin; (iv) Identify direct and indirect drivers affecting the integrity of the aquatic environment and biodiversity in the Ganga basin. (v) Pinpoint problematic areas and identify conservation priority zones; (vi) Strengthen/establish rescue and rehabilitation centres at strategic locations for aquatic species in distress; (vii) Involve communities and other stakeholders in the conservation process through capacity building, innovation and strengthening existing institutions; (viii) Garner support for aquatic biodiversity and Ganga conservation through education and outreach programs; (ix) Identify and analyse the hydro-socio-ecological relations in the river basin for efficient and targeted conservation action; (x) Prepare an action plan to minimize the negative impacts of the direct and indirect drivers on the aquatic environment and biodiversity of the select tributaries of the Ganga basin; and (xi) Develop a centralized facility of laboratories and resource centre for aiding in science based management of the Ganga River and its tributaries.

Progress

Post monsoon higher vertebrate survey was carried out in the mainstream Ganga River, from Haridwar to Farakka, covering a distance of 2,480 Km to enumerate occupancy and encounter rate of Gangetic dolphins, smooth-coated otters, gharials, muggers, and waterbirds. The post-monsoon (2022) higher vertebrate survey was initiated in Ramganga and Kosi rivers. Sampling sites were identified along the Yamuna, Ramganga and Gandak rivers to study fish diversity, and a post-monsoon survey focusing on fish diversity of the Ramganga River was carried out. Cataloguing and tagging of fish samples were done. Conducted experimental fishing and participated in the dolphin count survey in Samastipur, Bihar. A fish market survey was also undertaken in Samastipur, Bihar, to estimate the fish diversity. Literature review and report writing for the fish sampling conducted in the Ramganga River is in progress.

A vegetation survey has been initiated from Kaithi-Rajwari to the confluence area of the Gomti River to Pilibhit, Uttar Pradesh. So far, during the survey, 30 plant species belonging to 16 families were recorded. Biological samples were collected to assess genetic variability and gene flow patterns from selected fishes, turtle species, Gangetic dolphin and gharial. Genetic results of the Gangetic dolphin suggest that samples collected from different sites are genetically connected but sustain moderate genetic diversity. A new lineage of Giant river-catfish (Spereta sp.) was identified from the Ganga River between Munger, Bihar and Sahibganj, Jharkhand. Extremely low genetic diversity was detected in the Gharial populations studied by National Chambal Sanctuary and Katerniaghat Wildlife Sanctuary. The genetic signature of Gangetic turtle species was developed as a molecular reference database. The generated

database helps in species identification as well as in formulating in-situ and ex-situ conservation and management plans to improve rescue and rehabilitation strategies. During post-monsoon, the biological samples were collected from different locations from the Yamuna and Ramganga rivers in Uttarakhand, Ghaghra, Sai, and Rapti rivers in Uttar Pradesh.

Water quality parameters and heavy metal concentrations were investigated in the surface water of major tributaries of the Ganga River for the post-winter season (March-April 2021). The majority of the water quality parameters assessed in Gandak, Son, Kosi, Ghaghra and Ramganga were well within the aquatic life criteria, whereas for the Gomti and Yamuna rivers, the water quality parameters exceeded the aquatic life criteria at the majority of the sampling sites. Ecological Risk Assessment for heavy metals revealed low ecological risk at most sites in Gandak, Kosi, and Son, whereas the high ecological risk for Cadmium, Copper, Chromium, and Lead was observed at selected sites stretches of Gomti, Yamuna, Ghaghra, and Ramganga. Significant spatial variations observed in the water quality parameters and heavy metal concentrations in the tributaries reflect spatial variations of wastewater/sewage inflow, agricultural runoffs, flow regime and geophysical characteristics.

Upkeep and winter management of the rescue and rehabilitation centres at Narora and Sarnath were carried out. Meetings and discussions were carried out with the District Forest Officer (DFO), Ayodhya, Uttar Pradesh, to select locations for rescue and interpretation centres. Meetings were also undertaken with the Divisional Forest Officer (DFO), Haridwar, Uttarakhand and DFOs of Shahjahanpur, and Sitapur, Uttar Pradesh, for the establishment of a turtle rescue and interpretation centre.

Between April 2021 and March 2022, one national-level spearhead training programme was conducted for the spearhead team members from the Ganga Task Force (GTF) and Eco Task Force (ETF). The training workshop was attended by 25 personnel of the Ganga Task Force & Eco Task Force with their Territorial Army Wing of Indian Army units established in Uttarakhand & Uttar Pradesh. A lecture series, “Bird Population Monitoring”, for NPCIL personnel, was carried out in September 2021. The participants were sensitised on “Bird census techniques and citizen science”.

A total of 2,728 volunteers from the Ganga basin are part of the Ganga Prahari cadre. During the reporting period, a total of 606 volunteers joined the Ganga Prahari cadre. These volunteers are from the Ganga River's eleven tributaries and the Periyar river. A total of 929 activities were conducted, during which more than 40,000 participants were reached out. Online, 27 activities were conducted for the orientation and sensitization of new Ganga Praharis and consultation with stakeholders, during which 3,249 individuals participated. Ganga Praharis conducted a total of 339 activities and reached more than 13,000 people. Online, four activities were conducted by Ganga Praharis. A total of 29 livelihood activities were conducted across the Ganga River states, in which 893 people were trained. Of these 29 livelihood activities, 26 were conducted offline and three online. The livelihood training ranged from file cover and envelop making to sewing and stitching and SHG account maintenance. The maximum number of participants was recorded for sewing and stitching.

The 75th anniversary of independence was celebrated by launching a Mobile Exhibition depicting the biodiversity and livelihood of the people living on the banks of the Ganga River. This mobile exhibition travelled through the banks of the Ganga, Yamuna and Gomti rivers throughout Wildlife Week, *viz*. 1st October till 7th October 2021. The exhibition aimed to create awareness amongst school children and the community about the importance of clean water, an environment free of pollution and aquatic biodiversity. The mobile exhibition covered seven cities and reached out to about 1,500 people.

Jal-mala samwad, a low-cost interpretation centre, has been established in select schools along the tributaries in Uttar Pradesh. The research team identified seven schools for Jalmala Samwad in the Pilibhit, Sultanpur and Barabanki districts of Uttar Pradesh along the Gomti River. Panels were designed in identified schools in Pilibhit. Teachers in the identified schools were distributed the teaching kit – the *Ganga Gyan Kosh* and training was imparted to them on using the kit. Panels were designed for the *Jal-mala Samwad*, and school walls were painted accordingly.

Ganga Utsav was celebrated at 54 various locations along the Ganga River between 28 October to 3 November 2021. A total of 88 activities, such as awareness rallies, cleanliness drives, Ganga Prahari Handicraft Mela, and exhibitions on the cultural and ecological value of the Ganga River, were conducted, during which more than 10,000 people were sensitised and mobilized.

The Nadi Utsav across the 30 districts of 9 Ganga basin states was celebrated from 17-23 December 2021 through 166 activities with the participation of more than 14,000 people representing 22 stakeholder groups.

Outputs and Outcomes

During ecological surveys, Lesser flamingo (Phoeniconaias minor) was reported from Ramganga

for the first time. About 57 individuals of Indian skimmer, *Rynchops albicollis* were sighted from the Gomti River. An individual of mugger, *Crocodylus palustris* was recorded from the Lower Yamuna River near Kalpi, Jalaun district in Uttar Pradesh. An individual of three striped roofed turtle, *Batagur dhogoka* was sighted from the Ramganag River. An individual of smooth-coated otter, *Lutrogale perspicillata* was sighted again from the Ghaghra river, confirming presence of the breeding population of the species along the River.

Carnivore Turtle Centre was operationalized at Bhind, Madhya Pradesh along the Chambal River.

To strengthen the conservation measures, management planning for select priority areas along the mainstem Ganga River was done. Draft Action Plan for the Haiderpur Wetland – a newly nominated Ramsar Site, was prepared. The draft Management Plan for the Kachhua Wildlife Sanctuary in Uttar Pradesh was also prepared.

Milestones

Between April 2021 and March 2022, more than 2,00,000 participants from varied stakeholder groups were reached out, through a range of onsite and online activities.

Showcased activities conducted under the project for the conservation of Ganga basin biodiversity during the "Shining Uttar Pradesh 2021" programme organized by the Government of Uttar Pradesh on the occasion of Azadi ka Amrit Mahotsav at Varanasi.

During UP Climate Change Conclave 2021 at Lucknow from 28th to 29th October 2021, displayed the Project activities. Sh. Yogi Adityanath, Hon'ble Chief Minister of Uttar Pradesh, and other dignitaries from the centre and state governments visited the NMCG-WII project stall and appreciated the efforts undertaken in the project to conserve the Ganga River.

ONGOING PROJECT

LONG-TERM ECOLOGICAL OBSERVATORIES: LONG-TERM MONITORING OF BIRD DIVERSITY AND POPULATIONS ACROSS INDIA (THEME: NORTH-WEST ARID ZONE)

Funding Source
Ministry ofEnvironment, Forest and Climate Change

Investigator
Dr Sutirtha Dutta

Researchers
Varun Kher and other interns (voluntarily)

Date of Initiation
March 2020

Proposed Date of Completion
March 2025

Objectives

The objective of the project is to generate long-term information on bird communities, populations, demography, movements and long-distance migration to gain detailed information on the effects of climate and habitat change on birds.

Progress

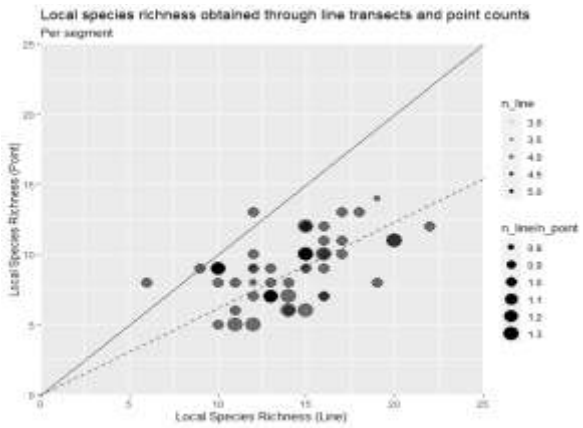
The LTEO bird team visited three sites in Gujarat-part of the north-west arid zone landscape, during 3-7 September 2021. This field visit aimed to visit the broad-scale LTEO sites in Gujarat and evaluate the suitability and feasibility of bird sampling. At each site, the research team visited multiple locations along with the forest theme and some independently to assess the habitat and identify possible kilometre-long transects. The bird theme targeted grassland habitats that are representative of the Northwest arid zone so as to capture avifauna that is typical of this landscape.

The research team conducted preliminary surveys on the selected transects during the winter of 2021-22

(December to February). One of the primary objectives during these preliminary surveys was to compare different methodologies to sample birds in the northwestern arid zone. The team thus surveyed Birds using both line transects and point counts to compare the results obtained through the two methods. For this, the team walked a total of 21 transects in Desert National Park WLS (DNP) and repeated them two to four times resulting in an effort of 110km. The centroids of the same transect were also surveyed two to four times in a point count framework. The data were then compared statistically to compare common community and population level parameters such as species richness, community structure, occupancy and abundance.Apart from transect and point counts in DNP for methodological comparisons, line transects were also walked in Gir WLS-NP and Hingolgarh WLS of Gujarat. The preliminary baselines generated during this year's sampling will be used for refining the methodology of the long-term monitoring program.

Outputs and Outcomes

A total of eight transects – four in Gir WLS-NP and four in Hingolgadh WLS - were tentatively selected for the long-term monitoring of bird communities and populations. The results from the DNP WLS clearly show that, in an open ecosystem such as the Thar desert, line transects capture more species per unit effort (no. of repeats) as compared to point counts. On average, point counts could only detect around 60% of the species detected by walking an equal number of line transects.



Similarly, line transects were also better at estimating the occupancy and abundance of species, particularly understory birds.

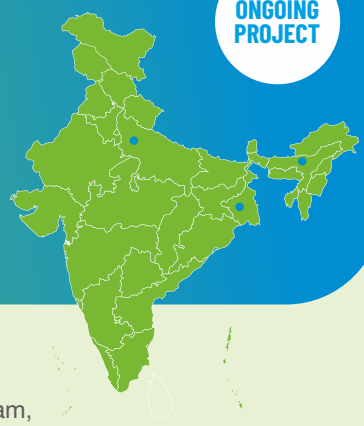
The research team recorded 8,948 Birds belonging to 87 species in the three study sites (DNP, Hingolgadh, Gir). The community structure was considerably different in the arid site Desert National Park WLS as compared to the two semi-arid sites Gir Wildlife Sanctuary and Hingolgadh Wildlife Sanctuary in Gujarat.

Milestones

Bird community parameters estimated for three Protected Areas (Gir, Hingolgarh and DNP) of the semiarid-arid biogeographic region.

DEVELOPMENT OF CONSERVATION ACTION PLAN FOR RIVER DOLPHINS (PHASE - I)

ONGOING PROJECT



Funding Source
CAMPA-Ministry of Environment,Forest and Climate Change

Investigators
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Researchers
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Date of Initiation
April 2016

Proposed Date of Completion
March 2025

Objectives

The objectives of the project are to (i) develop a monitoring protocol for dolphins; (ii) determine the Status of associated river fauna like Gharial, Otters, Turtles and Fishes; (iii) quality assessment of river habitat in terms of water quality, anthropogenic pressure and landscape surrounding riverscape; (iii) evaluate the current status of invasive species in riverscape; and (iv) involve stakeholders to develop a network which will assist in dolphin conservation.

Progress

The research team carried out outreach work and an exhibition on the Ganges River dolphin (GRD) in Kaziranga National Park. Reconnaissance work on dolphin abundance-Ganges River dolphin abundance survey and acoustic data collection using CPOD and Hydrophone was done to check the bridge construction's impact in Guwahati. Acoustic Data collection of the Ganges River dolphin was done using CPOD in 60 km stretch of Guwahati. An intensive fish sampling was carried out every 2km along the 60km stretch of Guwahati with three repetitive trials with a different mesh size of gill nets and ten trials of the cast net at each sampling site. The effort of 90 hrs and 320 hrs for Gille net and Cast net was performed, respectively. Riverine boat-based Bird and Herpeto fauna survey in the Guwahati stretch of the Brahmaputra River was carried out in a 60km stretch at a speed of 5-6km/hr. Sample collection for eDNA was carried out for a complete 60km stretch of the Brahmaputra River.

The samples of plankton, along with physicochemical parameters, were collected every 2km in a complete stretch of 60km. Kulsi river survey for ~62km for intensive study during dolphin getting stranded due to low water. In the intensive study area, many fishermen were interviewed regarding dolphins and turtles' net entanglement, the types of nets used by them, where they discard nets etc. The research team visited around six fish markets to survey and interview the fishermen. Acoustic data collection of Ganges River dolphins was performed using CPOD in three hotspots in the Kulsi river during an intensive study. Reports were submitted to Forest Department for the Kulsi river Dolphin stranded Report, Assam. The Dolphin website was developed.

Bird Survey (Line Transect and Point Count) for 10km in Feeder Canal, 5km in Taltala (Main Ganga, Farakka Barrage Upstream) and 10km in Beniagram (Main Ganga, Farakka Barrage Downstream) was conducted. The fish catch calendar was prepared. The team conducted fish Sampling every 2km in the 40km river stretch of Farakka Feeder Canal (Farakka to Jangipur) and 40km river stretch of Bhagirathi-Hooghly (Patuli to Mayapur) using Gill Net (50 trials), cast net (90 trials) and drag net (11 trials) along with Identification, Morphometry and preservation (both in Formalin and Ethanol). The team conducted plankton sampling following collection in six-time slots/24hr, preservation (Formalin), labelling and data entry for the 40km river stretch of Farakka Feeder Canal (Farakka to Jangipur) and the 40km river stretch of

Bhagirathi-Hooghly (Patuli to Mayapur). The team prepared a fish catalogue, listing fish collected from different spots in the Intensive Site 1-40km Farakka Feeder Canal river stretch (Farakka to Jangipur). The team repeated GRD Double Observer Surveys (3) from Farakka to Jangipur (40km river stretch) and Patuli to Mayapur (40km river stretch) along with habitat assessment and boat-based bird survey. Acoustic data collection of Ganges river dolphin was done using CPOD and YSI at every 2km in the 40km river stretch of Farakka Feeder Canal (Farakka to Jangipur) and the 40km river stretch of Bhagirathi-Hooghly (Patuli to Mayapur).

Outputs and Outcomes

Three repetitive surveys were carried out in Guwahati, which is the hotspot of dolphins. The average number was approximately ninety-six dolphins in the Brahmaputra River. In the Pinger experiment, the Ganges river dolphin response towards pinged nets is found to be effective in deterring them from monofilament nets and protecting them from net entanglement. Diurnal variation of Dissolved Oxygen in Guwahati was observed with the lowest value during the early morning (1:00 am-8:00 pm). The concentration peaked around the sunny hours between (11:00 am-3:00 pm). Herpetofauna (Birds and Turtles) were low in the 60 km intensive study stretch of Guwahati. Fish sampling in Guwahati recorded *Salmophasia boopis* and *Tenualosa hilsa* as the most abundant species. During the fish market survey in Guwahati, the team recorded 45 species, out of which people highly consumed 16 species. The most preferred fishes are *Tenualosa hilsa*, *Wallagu attu*, *Gibelion catla*. Among commercially and economically important species, Clupisoma garua (37%) and *Tenualosa ilisha* (8.43%) were the highest abundant species from both the intensive sites, respectively.

During an intensive fish market survey, among 71 different fish species found in Farakka, 64 were native, and 7 were invasive, and among 56 other fish species found in Mayapur-Patuli, 48 were native, and 8 were invasive. A total of 37, 39 and 31 species were recorded from each of the three fish markets surveyed at Kolkata, and 29 freshwater species were recorded from Diamond Harbour Fish Landing Site. *Tenulosa ilisha* (Rs. 1200-1600/kg in Farakka and Rs. 800-1000/kg in Mayapur-Nabadwip) was found to be the most costly and demanding fish species in the markets and landing sites of both Farakka and Mayapur.

Milestones

A total of 1,494 Birds comprising 30 species belonging to 18 families were sighted during the 35km boat-based transect in the feeder canal. 588 Birds were recorded during the boat-based bird survey for a 40km stretch of Patuli to Mayapur stretch in Hooghly. It comprises 32 species belonging to 17 families. The dolphin's least count was 42 in Patuli to Mayapur stretch, with an encounter rate of 0.97 individuals per km. In the feeder canal, the least count ranges from 3 to 10 dolphin individuals.

LONG-TERM MONITORING OF TIGERS, CO-PREDATORS AND PREY IN TIGER RESERVES AND OTHER TIGER BEARING AREAS OF VIDARBHA, MAHARASHTRA

ONGOING PROJECT

Funding Source
Maharashtra Forest Department
Maharashtra Forest Department

Investigators
Dr Bilal Habiband Field Directors of Respective Tiger Reserves

Co-Investigators
Dr (Capt.) Parag Nigam and DD/DFO of Respective Tiger Reserves

Researchers
Shaheer Khan, Shrushti Modi, A. Krishnan, Aayushi Saxena, Indranil Bhowmick, Jaydeep Patil, Kanishka Nilanjan Basu, Suman Koley, Syed Hazeem Qadri and Yash Dabholkar

Date of Initiation
February 2019

Proposed Date of Completion
February 2029

Objective

The project has the following objectives (i) Status of tigers, co-predators and their prey in the study sites; (ii) Development of a database on tigers across the landscape; (iii) Identification of tiger dispersal in the landscape; and (iv) Development of feedback for management intervention at reserve and landscape level.

Progress

Tadoba Andhari Tiger Reserve: Camera trapping exercise is being conducted across all ranges of Tadoba Andhari Tiger Reserve to estimate the density and abundance of tigers and leopards in a 2 km^2 grid-based framework. A total of 1,248 camera traps have been placed in 624 grids to cover the entire TATR in one block. The exercise will be completed by the end of June. The data collected through this exercise will then be processed and analysed to prepare the phase IV report of TATR for the year 2022. To estimate the density of ungulate species, a line transect survey was carried out in TATR in March 2022. A team surveyed each transect line during the early morning hours. The research team will analyse the data collected from this survey and the camera trap data.

In the southern boundary of Navegaon Nagzira Tiger Reserve, the river Wainganga flows, the only water source in the landscape. The buffer of NNTR is a matrix of ~ 185 villages, tourist rest houses and farmlands. Initially, a thorough sign survey camera trapping exercise was conducted in the Core and Buffer ranges of the Navegaon-Nagzira tiger reserve to estimate the density and abundance of tigers and leopards in a 2 km^2 grid-based framework. A total of 620 sites were selected for deployment of camera traps in the core area and buffer area of NNTR. Along with camera trapping, line transect surveys were also carried out in the study site's core and buffer areas to estimate the density of key ungulate species. A total of 172 transects were walked early in the morning in the month of February.

Bor Tiger Reserve: Initially, after a thorough sign survey camera trapping exercise was conducted in the Core ranges of Bor tiger reserve to estimate the density and abundance of tigers and leopards in a 2km^2 grid-based framework. Cameras were placed on 240 grids. Also, other mammalian faunas like Four-horned antelope, Jungle cats, Rusty-spotted cats, Wild dogs, and Jackal were photo captured during the session, along with the camera trapping, line and transect surveys were carried out in the study site's core and buffer areas to estimate the density of key ungulate species. Each transect line was surveyed during the early morning hours of the day.

Pench Tiger Reserve: Initially, after a specific sign survey camera trapping exercise was conducted in the entire tiger reserve to estimate the density and abundance of tigers and leopards in a 2 km2 grid-based framework. Cameras were placed in 310 grids. Also, other mammalian faunas like Indian Gaur, Four-horned antelope, Ratel, Jungle cat, Rusty-spotted cat, Wild dog, Jackal, and Grey wolf were photo captured during the session. Along with camera trapping, line transect surveys were also carried out at the study site to estimate the density of key ungulate species.

Painganga Wildlife Sanctuary: After a thorough sign survey camera trapping exercise was conducted in the entire tiger reserve to estimate the density and abundance of tigers and leopards in a 2 km2 grid-based framework. Cameras were placed on 77 grids. Also, other mammalian faunas like Four-horned antelope, Ratel, Jungle cat, Rusty-spotted cat, Wild dog, Jackal, and Indian Grey wolf were photo captured during the session. Along with camera trapping, line transect surveys were also carried out at the study site to estimate the density of key ungulate species. Each transect line was surveyed during early morning hours for seven consecutive days.

Pandharkawada Forest Division: After a thorough sign survey camera trapping exercise was conducted in the entire tiger reserve to estimate the density and abundance of tigers and leopards in a 2 km^2 grid-based framework. Cameras were placed in 110 grids. Also, other mammalian faunas like Four-horned antelope, Ratel, Jungle cat, Rusty-spotted cat, Jackal and Grey wolves were photo-captured during the session.

Tippeshwar Wildlife Sanctuary: After a thorough sign survey, a camera trapping exercise was conducted in the entire tiger reserve to estimate the density and abundance of tigers and leopards in a 2 km2 grid-based framework. Cameras were placed on 64 grids. Also, other mammalian faunas were photo captured during the session. Along with camera trapping, line transect surveys were also carried out at the study site to estimate the density of key ungulate species. Each transect line was surveyed during early morning hours for seven consecutive days.

Outputs and Outcomes

Melghat Tiger Reserve and Akola Wildlife Division: The Camera trapping exercise was conducted in 3 blocks covering 929 grids out of 964 grids in MTR from 4 February 2022 to 11 June 2022. A specially trained team of 24 Forest Guards was involved in placing 222 camera traps to carry out the above exercise in 30 beats of Akola Wildlife Division. Along with the camera trapping line, transect surveys were also carried out at the study site to estimate the density of key ungulate species.

Umred Paoni Karandhala Wildlife Sanctuary: Initially, after a thorough sign survey camera trapping exercise was conducted in the UPKWLS to estimate the density and abundance of tigers and leopards in a 2 km^2 grid-based framework. Cameras were placed in 91 grids. Also, other mammalian faunas like Four-horned antelope, Jungle cats, Rusty-spotted cats, and Wild dogs, Jackal, were photo-captured during the session. Along with camera trapping, line transect surveys were also carried out in UPKWLS of the study site to estimate the density of key ungulate species. Each transect line was surveyed during the early morning hours of the day.

Bramhapuri Forest Division: Initially, after a thorough sign survey camera trapping exercise was conducted in the BFD to estimate the density and abundance of tigers and leopards in a 2 km^2 grid-based framework. Cameras were placed in 350 grids.

Milestones

Progress was made in the population estimation of tigers, their co-predators and prey species at ten sites encompassing several protected areas of Eastern Vidarbha Landscape, Maharashtra. The phase IV training programme was conducted in all places in the Eastern Vidarbha Landscape with the collaboration of the Forest Department.

A COMPREHENSIVE STUDY ON THE ECOLOGY AND POPULATION STATUS OF A HUMAN COMMENSAL – THE HOUSE SPARROW *PASSER DOMESTICUS* IN THE UTTARAKHAND STATE

INITIATED PROJECT

Funding Source
Uttarakhand State Forest Department

Investigators
Dr R Suresh Kumar, Dr Vishnupriya, Kolipakam and Dr Dhananjai Mohan

Researcher
Renu Bala

Date of Initiation
April 2021

Proposed Date of Completion
March 2024

Objectives

The objectives of the project are to (i) understand the population and nesting ecology of house sparrows at select sites along an elevational gradient across the State; (ii) study the genetic structure of house sparrow populations so as to identify the presence of subpopulations if any and their evolutionary history in the Uttarakhand Himalaya; and (iii) investigate the presence of pesticides in house sparrows and possible correlation on the decline of house sparrow populations in the Uttarakhand State.

Progress

Reconnaissance surveys were conducted to gather information on the presence/absence and relative abundance of House Sparrows at multiple sites across Uttarakhand State. In February and March 2022, 100 nest boxes, each at two sites, Peeli Padav (Haridwar) and Maikoti (Rudraprayag), were deployed for intensive nest monitoring for the current breeding season.

Outputs and Outcomes

The individual encounter rate across the State was 19.7 individuals seen per km. In terms of the watershed, Yamuna had the maximum relative abundance of 28.6 individuals/ km, while the Kali watershed had the lowest relative abundance of 13.7 individuals/ km. It was observed that some rural habitats have more house sparrows due to the availability of more nesting and roosting spaces. More sparrows are seen in places where traditional houses are present and prefer to nest in traditional thatched-roof houses.

Milestone

The study, the first for the State of Uttarakhand, gathered detail information on the distribution of House Sparrows. The species was found to occur from the foothills to all the way up to 3,400 m.

INITIATED PROJECT

DEVELOPMENT OF CITY BIODIVERSITY INDEX OF BHOPAL AND INDORE CITIES OF MADHYA PRADESH

Funding Source
Madhya Pradesh State Biodiversity Board

Investigator
Dr Gautam Talukdar

Researcher
Avantika Adhruj

Date of Initiation
April 2021

Proposed Date of Completion
March 2023

Objective

Documentation of status of native biodiversity in the city and compute City Biodiversity Index of Bhopal and Indore cities of Madhya Pradesh.

Progress

Field visit for the data collection was undertaken. During the field visit, several meetings were fixed with the nodal officers of different departments and stakeholders to elaborate the project details and for the data collection. All the data was analyzed and compiled to prepare the City Biodiversity Index report and indicators of the index for Bhopal were computed.

The Natural Asset map was prepared and ground truthing for the validation of the land classes in Indore and Bhopal city is ongoing.

Outputs and Outcomes

Large amount of secondary information has been gathered from various agencies, stakeholders for calculation of city biodiversity index of Bhopal and Indore Cities of Madhya Pradesh. These data will serve as a baseline information for both the cities and will be helpful while revisiting again the city biodiversity index after a period of 5 years. Based on this, the draft City Biodiversity Index reports and maps for Bhopal and Indore city have been prepared Organization of Stakeholders Consultation workshop is proposed to be done in the month of June 2022. Training workshop for Madhya Pradesh State Biodiversity Board Staff has to be scheduled in WII. Dissemination workshop will be organised in the Indore. Reports and Maps have to be finalized and submitted.

Milestones

Madhya Pradesh have done exercise of computation of city biodiversity index of Bhopal and Indore for the first time. Key recommendations will be given to improve/ maintain score of each index with a list of responsible agencies to implement over a period of time.

INITIATED PROJECT

RANGE-WIDE ESTIMATION OF RIVER DOLPHIN

Funding Source
CAMPA-Ministryof Environment, Forest and Climate Change

Investigators
Shri Qamar Qureshi
Dr Vishnupriya Kolipakam

Researchers
Dr Abdul Wakid, Shovana Ray, Vineet Singh, Sunny Deori, Merin Jacob, Gargi Roy Choudhury, Kanad Roy, Abhishek Bettaswamy, Hiyashri Sharma, Ayan Dutta, Anurag Rokade, Bhavna Pant, Sneha Mane, Ranjana Negi, Aaranya Gayatri, Gautam, Jitul Kalita, Subhasree Das, Sajal Sharma, Syeda Tabassum Tasfia, Abhikrishna G, Abhishek Dudi, Aparna Santhosh, Arnab, Athul A, Atit Rai, Biswajeet Pujari, Devashish Saurav, Dipamoni Taye, Gunjan Chawla, Madhushree Das, Panchali Hazarika, Praful Pareek, Pranav Kulkarni, Pranjal Bhattacharjee, Rishav Bhattarai, Santosh HR, Shantam Ojha, Shyamal Saikia, Soumyadip Panja, Sreelekha Suresh P C, Srikrishna Narashiman, Supravat Mahata and Vijay Pratap Singh

Date of Initiation
September 2021

Proposed Date of Completion
December 2025

Objectives

The project has the following objectives (i) range-wide estimation of the River dolphin population in its ranges; (ii) estimation of the associated fauna in the river dolphin ranges; (iii) assessment of Water quality and pollution in the river dolphin habitat; (iv) intensive site monitoring of river dolphin, associated fauna and its habitats; (v) intensive study on the availability of river dolphin prey species; and (vi) involve stakeholders to develop a network which will assist in dolphin conservation.

Progress

The publication of a standardized multilingual field guide on "Monitoring Ganges and Indus River dolphin, associated aquatic fauna and habitat" was prepared. Range-wide River dolphin estimation was carried out in 8 states of River dolphin ranges: Uttar Pradesh, Bihar, Jharkhand, Madhya Pradesh, Rajasthan, Assam and West Bengal and for the Indus River dolphin in Punjab. Surveys were carried out in the following tributaries: (a) Assam-Kulsi and Subansri river; (b) West Bengal – Rupnarayan river; (c) Rajasthan, Madhya Pradesh and Uttar Pradesh, - Chambal River; (d) Punjab-Beas River (Tributary of Indus River); (e) Associated Fauna survey for the bird species of concern, gharial, muggers, otter, turtle in the eight states main channels and the tributaries of Brahmaputra and Hooghly was carried out.
Both on-field and online training and workshops were carried out for the state forest staff, partner NGOs and institutions to participate in the range-wide estimation exercise. Plankton samples were collected during range-wide exercise, and the analysis is ongoing. The e-DNA samples were collected during a range-wide exercise, and the analysis is ongoing. All eight states carried out habitat data collection and the water quality assessment. Acoustic data was collected using A-Tags and F-PODs along with the dolphin abundance estimation to correct the unavailability bias.

Outputs and Outcomes

A total of ~3,629 km of the survey was carried out in the eight states to estimate the population of the Ganges River and Indus River dolphins in India. The estimation of other associated biodiversity was also carried out. A total of ~355 people were trained for the Ganges River dolphin estimation exercise, equipment handling and associated fauna estimation.

Milestones

First time a pan India survey was carried out for estimating the Ganges and Indus river dolphin population in its current distribution range in India.

INITIATED PROJECT

UTTARAKHAND STATE WILDLIFE POPULATION ESTIMATION, 2020-2022 HIMALAYA ZONE (>1,000 M AND <3,500 M)

Funding Source
Uttarakhand Forest Department

Investigators
Dr S. Sathyakumar

Researchers
Ranjana Pal, Aayushi Kanduri, Ankita Das, Aparna Shukla, Gaurav Sonker, Himangshu Bora, Janam Jai, Manisha Mathela,Neha Aswal,Pooja Chaudhary, Pooja Pant, Ragini Muddaiah, Sayli Suresh Sawant,Shagun Thakur, Shiv Narayan Yadav, Shivangi Sanjiv Bendre, Subhechha Tapaswini, Syed Mohammad Muzammil and Tuheina Thakur

Date of Initiation
May 2021

Proposed Date of Completion
September 2022

Objectives

The project aims to produce a spatially explicit abundance estimation of major wildlife species in the mid-Himalayan Zone of Uttarakhand. The population estimation exercise is planned in two phases: Phase I, which would generate baseline information in the occupancy framework, and Phase II, which would sub-sample Phase I areas for density and population estimation for target species.

Progress

Phase I sampling of Uttarakhand State Wildlife Population Estimation (UWPE) project: Fieldwork pertaining to Phase I of the UWPE project has been completed. During 13-17 December 2021, a one-day Division-level training programme was organised by WII project personnel in 21 Forest Divisions of the mid-Himalayan zone. After the workshop, frontline staff conducted systematic sign surveys and scat sampling in all forest beats of 21 Forest Divisions in the mid-Himalaya zone between the 20th and 24th of December under the supervision of the concerned Forest Officials. During the exercise, one WII researcher was stationed in each forest division in the mid-Himalayan zone to provide technical assistance. Information on the relative abundance of 12 species was generated using sign survey methodology, and about 15,000 scat samples were collected from the mid-Himalayan zone.

Phase II sampling of Uttarakhand State Wildlife Population Estimation (UWPE) Project: Phase II sampling (Population estimation) of the UWPE project is currently in progress. The sampling was completed in seven blocks. Three blocks (Rudraprayag, Pithoragarh, and Tehri Divisions) were sampled in the subtropical forest (1000–2000 m) habitats, and four blocks (Bageshwar, Pithoragarh, Nainital, and Kedarnath Divisions) were sampled in temperate and subalpine (2000 to 3500 m) habitats. Camera traps were deployed in 104 grids of 5 km2 using a spatial capture-recapture and distance sampling (with camera traps) framework. Camera trapping efforts of 8,000 trap days have yielded capture data on 19 mammals. Additionally, transects (N = 196; 535 km) and scat sampling were done to generate density for ungulates and presence information for carnivores. In addition to these sampling blocks, information from the other recent research projects (2015 and later) is being processed from two areas in Uttarakhand: Uttarkashi and Garhwal divisions. Currently, data is being processed for the density estimation of target species.

Uttarakhand State Macaque and Langur Population Estimation, 2021: Along with Phase I sampling of the UWPE project, WII project personnel also coordinated the training and execution of the macaque and langur census exercises carried out by forest officials

throughout the state (> 3000m) in December 2021. The information on macaques and langurs was received and compiled from all the forest divisions of Uttarakhand. The survey report and beat-level total counts of macaque and langur information have been submitted to the forest department (interim and draft final reports).

Outputs and Outcomes

In Phase I, information on the relative abundance of 12 species using sign survey methodology was generated for the mid-Himalayan zone of Uttarakhand. ~1500 scats were collected from the beats of 21 divisions and will be evaluated for species identity and numbers. In 21 divisions of Uttarakhand, training sessions were held where front-line staff learned how to use different tools and methods for monitoring wildlife. As part of Phase II, camera trapping efforts of 8000 trap days yielded capture data on 19 mammals from the mid-Himalayan habitats of Uttarakhand. The analysis of SPAI-step 1 questionnaire samples yielded snow leopard habitat suitability in Uttarakhand. Uttarakhand state macaque and langur population estimation showed that a total of 110,840 macaques and 38,011 langurs were found.

Milestones

Population estimation of macaque and langur in Uttarakhand state has been completed.

DEVELOPMENT OF A GENETIC DATABASE OF CAPTIVE ELEPHANTS ACROSS INDIA FOR WELFARE AND MANAGEMENT

INITIATED PROJECT

Funding Source
Project elephant MoEFCC

Investigator
Dr Samrat Mondol

Researcher
Ankit Pacha

Date of Initiation
September 2021

Proposed Date of Completion
August 2023

Objectives

The objectives of this project are to (i) establish a set methodology for undertaking captive elephant genetic studies and generate a DNA data archive on Indian elephants. This was planned to achieve through a set of critical goals; (ii) Develop standard operating protocols (SOP) for the collection of DNA samples from various sources from an elephant; (iii) Develop a tamper-proof sampling kit for biological sampling for database development and maintenance of 'Chain of Custody (CoC)' for legal procedures; (iv) Develop a manual for directing the collection of blood samples from captive elephants; and (v) Standardize and test a set of microsatellite markers for individual elephant identification and forensic use pan India; (vi) conduct a training program for veterinarians under Forest Department in sample collection and data collection and other necessary procedures to achieve EGDB goals; and (vii) Generation of genetic data from the pilot states focused in the first part of EGDB project.

Progress

The MoEFCC has issued all necessary directions to respective State Forest Departments to initiate the implementation of the EGDB program. Subsequently, all required permissions related to EGDB sampling (blood samples) have been received from respective state forest departments of the pilot phase. The research team has developed all required SOPs for sample collection from captive elephants to maintain 'Chain of Custody' as per standard forensic protocols. These SoPs were commented on by experts in the field as well as the Ministry of Environment, Forest and Climate Change. The Draft SoPs were approved by the Ministry of Environment, Forest and Climate Change on January 2022.

The research team designed an elephant-specific forensic kit for field sampling following inputs from

Project Elephant, Government of India. This kit was presented at the Ministry of Environment, Forest and Climate Change and was approved. Subsequently, the team prepared these kits and distributed them to the respective Forest Departments of 5 pilot states (Delhi, Haryana, Chhattisgarh, Uttarakhand and Tamil Nadu) for field use. This was the first time any such effort had been made in India.

An Android application 'GAJAH SUCHNA' was developed to collect physiological and pictorial data of captive elephants sampled by the field sampling kit. A training program was held on 11th February 2022 for the forest department veterinarians of five pilot states to prime them with sample collection methodologies and data entry in the Android application.

The research team received samples from 5 states, namely Delhi (n=3), Haryana (n=5), Chhattisgarh (n=10), Uttarakhand (n=26) and Tamil Nadu (n=44). The research team finalized 15 primers from a set of 30 already published sets of primers used for Asian elephants. These primers were used to generate data for all the elephants whose samples were collected

Outputs and Outcomes

Sampling kits were distributed to five states - Delhi (3), Haryana (5), Chhattisgarh (12), Uttarakhand (35) and Tamil Nadu (145). A total of n=88 samples and physiological and pictorial data were collected from five captive elephant states. About 50% of the animals sampled so far are of wild-caught origin (n=43). Twenty-three of them are captive-born, and 22 did not have any information regarding their origin. The number of male and female elephants was almost equal across these states, *i.e.*, n=42 and n=46, respectively. The resolution power of correctly assigning an elephant to an individual genotype via this primer set (n=15) was decided by the $PID_{(sibs)}$ score (7.4×10^{-6}). This means that in a population of a hundred thousand elephants, approximately one would get assigned a wrong genotype. Pertaining to the recent population of Asian elephants in India, approximately 30,000, the primer set provides an excellent individual assignment power.

The Bayesian clustering analysis of the genetic data broadly segregated the northern (Delhi, Haryana and Uttarakhand) and central (Chhattisgarh) into one population and the southern (Tamil Nadu) into another population. A few individuals also showed mixed genetic signatures, which can be expected due to the history of inter-state translocations. Further, a non-Bayesian clustering analysis also identified two genetic clusters (K=2) where one cluster belonged to most of the samples of Tamil Nadu and the other accrued samples from Delhi, Haryana, Uttarakhand, Chhattisgarh and few samples of Tamil Nadu, which again points towards inter-state translocation..

Milestones

The work has been extended to two more states. Sampling kits have been sent to Rajasthan and Uttar Pradesh. We can expect samples from these states very soon to supplement our dataset.

The Android application is one of its kind, collecting physical and pictorial data of all the captive elephants along with the official information of the elephant and the authority in charge helping in accreting the data in a centralized data here at the Wildlife Institute of India.

RhODIS-INDIA PHASE II

Funding Source
Ministry of Environment,Forest and Climate Change

Investigator
Dr Samrat Mondol

Researcher
Tista Ghosh

Date of Initiation
April 2021

Proposed Date of Completion
April 2024

Objectives

The objectives of this project are to (i) Expansion of RhoDIS-India database; (ii) Assessment of mitogenome variations to understand the evolutionary history of Indian rhino populations; (iii) Development of a molecular sexing approach for one-horned rhinoceros; (iv) Development of crime investigation kit for rhino crime scene investigations; (v) Whole genome sequencing of Indian rhinos to develop a panel of global rhino markers for forensic use.

Progress

The whole mitogenome data was generated for all Indian rhino populations, followed by the identification of polymorphic sites to assess the mitochondrial genetic variation in Indian rhinos. A concatenated sequence of 2,531bp covering all the polymorphic sites was generated using eight primers for 111 samples to investigate the phylogeography patterns. This was done to identify the maternal clades using three approaches implemented in the Haplotype network, BAPS (Bayesian) and phylogenetic tree construction. Further, we estimated the divergence time among the clades to understand the evolutionary history of Indian rhinos.

At the initiation of the RhoDIS-India program, it was envisioned that significant effort was required in terms of training and building infrastructure towards wildlife crime scene investigation (particularly focusing on rhinos). In this regard, the research team planned to provide the first five crime investigation kits to the Assam Forest department, as it harbours the largest Indian rhino population. The kit contents were finalized through multiple discussions with MoEFCC, WCCB and other forensic experts from the Government of India.

To expand the RhoDIS program to a global scale, this phase of the project planned to conduct genome sequencing of Indian rhinos to design more robust primers that can be tested in other labs. In this regard, multiple samples from each park have been selected and sent for genome sequencing to our collaborating agency Nucleome Informatics, Hyderabad. The data generation for genome sequencing is underway.

Outputs and Outcome

The whole mitogenome data screening identified 21 polymorphic sites across Indian rhino populations. Further, the phylogeography analysis shows that Indian rhinos are genetically structured into three maternal clades corresponding to Assam, West Bengal and Uttar Pradesh. Among the three, Assam is the most diverse one consisting of 28 haplotypes, whereas the other two clades are monomorphic.

Comparing our data with the existing literature confirmed that the reintroduced population of Uttar Pradesh showed maternal signatures of Chitwan National Park, Nepal. Further, the divergence date estimation analysis suggests that the one-horned rhino diverged from its recent common ancestors ~950 Kya (thousand years ago) and different populations (Assam, West Bengal and Uttar Pradesh/Nepal) coalesce at ~190-50 Kya, corroborating with the paleobiogeography history of the Indian subcontinent.

All the kits have been prepared, and dispatch is awaited for the delivery of the metal detectors. These kits will be delivered to Assam and distributed across different parks.

Milestones

To the best of our knowledge, this is the first report of wild Indian one-horned rhino mitogenome from all the extant populations. The phylogeography and phylogenomic outcomes suggest recognising three 'Evolutionary Significant Units (ESUs)' in Indian rhinos. Given that multiple reintroduction programs are planned as per the 'National Conservation Strategy for the Indian One-horned rhinoceros, *Rhinoceros unicornis*, Government of India, Ministry of Environment, Forest and Climate Change, 2021' objectives (in the states of Uttar Pradesh, Bihar, West Bengal and Assam) soon, the genetic signatures described in this study would be very helpful in selecting appropriate areas to identify founder animals.

The research team submitted the findings of mitochondrial DNA work to a peer-reviewed journal whose details are given in the 'Publication' section. The team also presented the work at two international conferences (details provided in the appropriate sections).

ASSESSMENT OF WILDLIFE VALUES AND LAND TENURE FOR PLANNING RATIONALIZATION OF BOUNDARIES FOR CHANGTHANG AND KARAKORAM WILDLIFE SANCTUARIES, LADAKH

INITIATED PROJECT

Funding Source
Department of Wildlife Protection, UT Ladakh

Investigators
Dr S. Sathyakumar, Dr Bilal Habib and Dr Salvador Lyngdoh

Project Personnel
Dr Upma Manral, Dr Ajaz Hussain Abhipsha Ghosh, Apoorva Thapa, Arif Ahmad, Anshuman Pati, Himanshi Sharma, Prateek Savita, Priyadarshan Pandey, Priyadarshini Mitra, Prativa Bomzon, Rameshwar Ghade, Shivani Parmar and Tribhuwan Singh

Date of Initiation
July 2021

Proposed Date of Completion
September 2022

Objectives

The objectives of the project are to (i) Identify areas within Changthang and Karakoram WLS in High Conservation Value (HCV) categories; (ii) Delineate and map HCV Areas in and around Changthang WLS and Karakoram WLS; (iii) Conduct a stakeholder analysis through local consultations and ascertain wildlife values and natural resource dependencies; and (iv) Devise strategies and actions for the future conservation of HCV Areas in the Karakoram and Changthang WLS.

Progress

A framework based on High Conservation Value (HCV) Forest is adapted to meet the project objectives. 'HCV Areas' is an emerging concept that uses a range of factors to identify important forest/ natural areas, including biodiversity, landscape context, vulnerable or endangered ecosystems, provisioning of fundamental ecosystem services, and local community reliance. The five project deliverables are as follows: (i) Interim Report with progress on assessment of wildlife values and framework for rationalisation, Methodology for various HCVs, collection of existing information and compilation for Changthang WLS; (ii) Interim Report with progress on assessment of wildlife values and framework for rationalisation, Methodology for various HCVs, collection of existing information and compilation for Karakoram WLS; (iii) Second Interim Progress Report with progress and stakeholder workshop report, biodiversity values and potential categorisation of HCVAs for Changthang WLS; (iv) Second Interim Progress Report with progress and stakeholder workshop report, biodiversity values and potential categorisation of HCVAs for Karakoram WLS; and (v) Final Report with Maps and Report with Detailed Listing of HCVAs and Management Recommendations for Changthang WLS and Karakoram WLS.

Outputs and Outcomes

Interim Report with progress on assessment of wildlife values and framework for rationalisation, Methodology for various HCVs, collection of existing information and compilation for Changthang WLS.

This interim report comprised progress on the assessment of wildlife values and framework for rationalisation, methodology for identifying HCVAs, and compilation of existing information on various biological and social aspects of PA management in Changthang WLS. Project personnel worked on secondary data collected from various government departments and agencies, a compilation of existing published literature on various biodiversity and human-nature linkages, and conducted a rapid field survey in the Changthang landscape in August-September 2021. WII faculty and the project scientists held consultation meetings with the Chief Conservator of Forest and Wildlife, the Chief Wildlife Warden (Department of Wildlife Protection), the Secretary (PDD/ITI/Animal and Sheep/Coop/ Labour and Employment) and the Secretary (Tourism and Culture). The faculty members also met with Dr R.K. Mathur, Hon. Lieutenant Governor, UT of Ladakh, to apprise him about the initiation of work and plan of action. A total of 120 publications from the

Changthang landscape were reviewed, comprising research papers, journal/ review articles, scientific reports, books or book chapters, PhD theses or MSc dissertations, field guides, and a directory. A detailed methodology for rationalization and the HCVA framework was enclosed. Species occurrence maps were prepared for key mammalian fauna, with data on the occurrence/ locations of the species collected from sources such as GBIF, extensive literature review, communications with experts and other personnel working in the region, and during the team's survey of the area.

Interim Report with progress on assessment of wildlife values and framework for rationalisation, Methodology for various HCVs, collection of existing information and compilation for Karakoram WLS.

The approach for developing this report was similar to the first deliverable. A total of 78 publications from the Karakoram WLS were reviewed, and a rapid field survey was conducted in November-December 2021. The interim report comprised an assessment of wildlife values of Karakoram WLS, including species occurrence maps for key mammalian fauna, human-nature linkage in the region, methodology and framework for identifying HCVAs in Karakoram WLS. Second Interim Progress Report with progress and stakeholder workshop report, biodiversity values and potential categorisation of HCVAs for Changthang WLS.

For this report, HCVAs have been identified and delineated for the Changthang area. The team received camera trap data and Micro-level planning (MLP) data from the Department of Wildlife Protection, Leh, in November 2021. The MLP data comprised a household-level questionnaire survey of 2188 households from 22 villages of Durbuk and Nyoma blocks.

Milestones

The team worked on 198 folders containing 334,563 camera trap images from the Changthang region. The team geotagged and segregated these images per animal species and did Species Distribution Modeling for key mammalian and avian species. Available Open Series Maps Toposheets from Survey of India and of 1:250000 scale from USA surveyor Department web pages were downloaded and completed Land Use Land Class (LULC) classification using Landsat, Cartisat and Liss IV imageries.

PROPOSAL FOR PREPARATION OF WILDLIFE MANAGEMENT PLAN AND IDENTIFICATION OF LOCATIONS FOR ANIMAL UNDERPASSES OF THE 3RD RAILWAY LINE FROM DAREKASA TO SALEKASA STATIONS, GONDIA DISTRICT, MAHARASHTRA

INITIATED PROJECT

Funding Source
South-East Central Railway (Construction)

Investigator
Dr Bilal Habib

Researchers
Akanksha Saxena, Adil Khan and ndushree Maharana

Date of Initiation
October 2021

Proposed Date of Completion
October 2022

Objectives

The project has the following objectives (i) Preparation of a scientific Wildlife Management Plan for ten years, and (ii) Assess the existing and proposed railway tracks to suggest locations for animal underpasses.

Progress

The proposed railway track is supposed to pass through a critically important tiger corridor in the Central Indian landscape. It will be constructed in the forested tracts in the Nawatola region in the Gondia district of Maharashtra.

Two surveys were conducted in December and April to suggest structures for facilitating wildlife movement. A report containing details of mitigation structures proposed on the 3rd railway track was prepared. A total of nineteen structures of different categories have been proposed on the basis of elevation profile, structures on the existing railway lines, the presence of streams and the target animals in mind.

An intensive field survey for the project was conducted between April and May. We surveyed a stretch of 6 km along the railway line, plus an additional 4 km stretch beyond the Darekasa railway station that comes under the tiger corridor region. A detailed survey was conducted for plants, mammals and birds to estimate the biodiversity of the region. An area close to 45 km^2 was systematically sampled. Over 50 tree species, close to 60 bird species, 17 mammals and three reptilian species were identified in the region by means of transact survey, point count and sign survey and opportunistic sightings, respectively. In addition to these, interviews were conducted with the concerned forest officials of the Forest Department of Maharashtra- Gondia division, Forest Development Corporation of Maharashtra (FDCM) and the Joint Forest Management Committee, Nawatola, Gondia (Maharashtra), for the preparation of Wildlife Management Plan. Secondary data was collected from the respective departments regarding the human-animal conflict scenario in the region. The practice of the Wildlife Management Plan is ongoing.

Outputs and Outcomes

A report containing suggestions for constructing animal underpasses was forwarded to the SECR titled – "Mitigation measures for existing and proposed tracks of the Darekasa- Salekasa railway line, Gondia, Maharashtra".

ACADEMIC & TRAINING ACTIVITIES

Academic programme

XVII M.Sc. (Wildlife Science)

During the reporting period M.Sc. XVII Course in Wildlife Science was completed at the Institute. The students have done their dissertation training from the various State Forest Departments. The course concluded on 31 July 2021. All twenty students have successfully completed the course. Their dissertation details are given below:

M.Sc. Dissertation

S.No.	Name of Student	Dissertation Topic
1.	Aaroha Malagi	A Functional trait approach to quantify the effects of grazing on understory vegetation in a South Indian Savannah
2.	Anjitha Devarajan	Survival in the modified landscape: Effect of tea plantations on Anamalai Spiny Lizard, *Salea anamallayana*
3.	Anubhuti Krishna	Contributors to leopard and Tiger Co-existence in Rajaji National Park-Uttarakhand
4.	Avichal Tatu	Thermal ecology of Spiny-tailed Lizard, *Saara hardwickii* and its vulnerability to climate warming
5.	Divya Dwivedi	Understanding the Habitat and Behavioural Ecology of Terai Gray Langur
6.	Gitima Das	Assessing the efficacy of selected conflict mitigation strategies in a human-elephant shared landscape of Golaghat, Assam, India
7.	Jason B. Coutinho	Characteristics of vegetation and bird communities in Urgab Green Spaces relative to the surrounding matrix: A study in the urbanising Doon Valley
8.	Jithin V	Tadpoles with a trick -Ecological aspects of overwintering tadpoles in the montane-streams
9.	Joonu Chakma	Responses of wild ungulates to its proximity to human settlement and the perception and attitude of local people of wild ungulates in Dampa Tiger reserve, Mizoram, India
10.	Joshua Dharamaraj	The behavioural and acoustic repertoire of Irrawaddy Dolphins and their response to anthropogenic disturbance.
11.	Manu Mohan K	Modelling human-tiger interactions and conflicts as a function of reintroduction-based population growth in Panna Tiger Reserve in Central India
12.	Ashish Nambiar	Plant intra-specific trait variation across an elevation gradient
13.	Pranav K. Gokhale	Study on mixed - species Bird Flock Assemblages and Insect Sampling
14.	Lovepreet Singh	Swamp deer status and habitat dynamics in Pilibhit-Bhira Forests of Sharda Habitat Block
15.	Tarun Singh	Comparative analysis of abundance estimation methods for ungulates along with their spatiotemporal interaction and habitat use in Pakke Tiger Reserve, Arunachal Pradesh
16.	Vignesh Chandran M	Study of some important aspects of breeding ecology and vocalization of Jungle Prinia" in Punjab
17.	Yathumon M.A.	Visitation Pattern of Mammalian Communities at waterholes in Tadoba - Andhari Tiger Reserve

S.No.	Name of Student	Dissertation Topic
18.	Yukti Taneja	Role of native frugivores in fruit removal, seed dispersal and germination of the invasive *Lantana camara* across different habitat types in the Dehradun Valley
19.	Mohd Abdus Shakur	Ant community structure in a fragmented landscape
20.	Zankhnaben T. Patel	Understanding impacts and consequences of Patch isolation on the plant-seed disperser community in Southern Western Ghats at the Anamalai Tiger Reserve

First M.Sc. (Heritage Conservation and Management)

For the completion of their MSc in Heritage Conservation and Management (MSc HCM) course following their fieldwork in the preceding months, the first batch of students presented the dissertations of topics of heritage importance to an external panel of evaluators on 30-31 July 2021. The presentations spotlighted the diversity of interests amongst the students and the broad scope of heritage studies as topics from natural, cultural and interlinked domains were explained to a receptive audience assembled in the WII Auditorium and streamed online. The names of the students and the titles of the dissertations are listed below:

Dissertation Topics

S. No.	Name of Student	Dissertation Topic
1	Abhishek	Relocation and Resilience: A Case Study from Sariska Tiger Reserve
2	J Bhaalasaraswathi	Pre and Post-COVID-19 Transformation in the Financial and Marketing Practices of Museums: An Analysis of the Government Museum Chennai, and City Palace Museum, Udaipur
3	Devashish Saurav	Storied Landscapes: A Study of the Ecological Narratives of the Bhotiyas (Tolchhas, Marchas and Jads) of Uttarakhand
4	Malsawmdawngliana	Assessing the Impact of the Traditional Practice of Frog Consumption on Amphibian Population from Mizoram, India: Culture-Nature Perspectives
5	Roshme Borgohain	Assessing the Impact of Road Network on Wildlife Corridors and Mitigation Measures in Assam: Transportation against Animal Corridor
6	Varsha S	The economy as a Driver of Functional Continuity of Living Religious Heritage: The Case of Sri Ranganathaswamy Temple at Srirangam
7	Vishnuvardhan	Conserving Natural Heritage through Genetic Assessment: The case of Snow Leopards in Ladakh

The dissertation presentations and subsequent grading of the students marked the successful passing out of the first batch of seven students of MSc in Heritage Conservation and Management.

Status of Doctoral Research in WII

Awarded

Bhim Singh (2022). **Molecular phylogeny and population genetic structure of northern Red muntjac, *Muntiacus vaginalis* in India.** Saurashtra University, Rajkot, Gujarat. Supervisor: Dr V.P. Uniyal.

Frank Sadrak Jabraj Dhanraj (2021). **Ecology and Conservation Aspect of Waterbird Breeding Colonies in Tamil Nadu.** PhD thesis Submitted to Saurashtra University. Supervisor: Dr Gopi GV.

Kamalika Bhattacharya (2022). **Moth, Lepidoptera assemblages along an altitudinal gradient in Singalila and Neora Valley National Park, Central Himalaya, an ecological and molecular approach emphasising Noctuidae.** Saurashtra University, Rajkot, Gujarat. Supervisor: Dr V.P. Uniyal.

Kritesh Dey (2022). **Studies on Assemblage of spiders (Arachnidae: Araneae) in different riparian zones of the river Ganga**. Forest Research Institute (Deemed to be) University, Dehradun. Supervisor: Dr V.P. Uniyal.

Kumari Vandana (2022). **Assessment of Pollinators in indigenous farming systems in Garhwal Himalaya, Uttarakhand.** Forest Research Institute (Deemed) University. Supervisor: Dr V.P. Uniyal.

Pooja Rani Sinha (2022). **Prediction of quality of water emphasizing nutrient dynamics in Kosi watershed Uttarakhand.** Forest Research Institute (Deemed to be) University, Dehradun. Supervisor: Dr V.P. Uniyal.

Priyanka Kashyap (2022). **Soil nematode community structure along an elevational gradient in Bhagirathi Basin, Uttarakhand - A morphological and molecular approach**. Saurashtra University, Rajkot, Gujarat. Supervisor: Dr V.P. Uniyal.

Rommila Chandra (2022). **Assessment of socio-environmental adaptation strategies for sustainable livelihood development in the villages around Govind Pashu Vihar, Uttarkashi, Uttarakhand.** Forest Research Institute (Deemed to be) University, Dehradun. Supervisor: Dr V.P. Uniyal.

Sumit Kumar Arya (2021). **Patterns of avian diversity in different land-use and forest patch sizes of Kumaon Himalayas, Uttarakhand.** PhD thesis Submitted to Saurashtra University. Pp 201. Supervisor: Dr Gopi GV.

Uttaran Bandyopadhyay (2022). **Diversity and distribution pattern of moths (Lepidoptera: Heterocera) with special emphasis on family Noctuidae in Askot Wildlife Sanctuary, Uttarakhand.** Saurashtra University, Rajkot, Gujarat. Supervisor: Dr V.P Uniyal.

Thesis Submitted:

Aisho Sharma Adhikarimayum (2021). **The aspect of the ecology of large carnivores and their prey in and around Dibang Wildlife Sanctuary, Arunachal Pradesh, Indi**a. PhD thesis Submitted to Saurashtra University. Supervisor: Dr Gopi GV.

Registered

Abha Purohit (2021). **Species diversity and molecular study of bees, Bombus and Xylocopa in Dehradun district, Uttarakhand, India.** Saurashtra University, Rajkot, Gujarat. Supervisor: Dr V.P Uniyal.

Irina Das Sarkar (2021). **Diversity, assemblage, and functional trait patterns of spiders (Araneae: Araneomorphae) along an elevational gradient in Himachal Pradesh, India.** Saurashtra University, Rajkot, Gujarat. Supervisor: Dr V.P Uniyal.

Kamna Pokhariya (2021). **Assessment of above-ground carbon stock in tropical dry deciduous forests of Panna Tiger Reserve, Central India.** FRI University, Dehradun. Supervisor: Dr Amit Kumar.

Shabnam Kumari (2021). **Ecological assessment of Geometridae moths (Lepidoptera: Heterocera) along an altitudinal gradient in the Dhauladhar mountain range in Kangra (North Western) and Lahaul & Spiti (Trans Himalaya) regions of Himachal Pradesh**. Forest Research Institute (Deemed to be) University, Dehradun. Supervisor: Dr V.P. Uniyal.

Shuvendu Das (2021). **Diversity and distribution of dragonflies and damselflies (Insecta: Odonata) assemblages along an altitudinal gradient in the Bhagirathi and Teesta river landscape**. Saurashtra University, Rajkot, Gujarat. Supervisor: Dr V.P Uniyal.

Sipu Kumar (2021). I**mpacts of habitat degradation and invasive species on plant-frugivore communities in the Shivalik Hills, India.** FRI University, Dehradun. Supervisor: Dr Amit Kumar.

Pallabi Das (2021). **Assessment of insect pollinators in agro-ecosystem along the Gangetic plains of southern West Bengal.** Saurashtra University, Rajkot, Gujarat. Supervisor: Dr V.P Uniyal.

Ritesh Kumar Gautam (2021). **Plant-insect pollinator interactions along the elevational gradient in different habitat types of Kedarnath Wildlife Sanctuary, Uttarakhand.** Forest Research Institute (Deemed to be) University, Dehradun. Supervisor: Dr V.P Uniyal.

Training programmes

XLII Post Graduate Diploma in Advanced Wildlife Management, 1 November 2021 to 31 August 2022

The Post-Graduate Diploma Course in Advanced Wildlife Management for in-service Forest/ Wildlife Officers engaged in managing natural forest resources, particularly wildlife and protected areas, commenced on 1 November 2021 at the Wildlife Institute of India. This 10-month course is designed to enhance the capacity of forest officers to effectively manage Protected Areas (Pas), wildlife-related issues outside PAs and the conservation of endangered species.

The course would provide the participants training of modern tools and techniques of Wildlife Management, including the preparation of scientific management plans for Protected Areas and forested landscapes. Further, the course will provide a foundation of modern concepts in wildlife science and provide an understanding of the relevant global, regional, national and state-level conservation policies and legislation and their enforcement. Their Wildlife Orientation Tour was conducted in the Rajaji Tiger Reserve. Ten Officer Trainees from Assam, Gujarat, Karnataka, Kerala, Maharashtra, Odisha, Telangana, and Uttarakhand joined the 42nd PG Diploma Course.

XXXVI Certificate Course in Wildlife Management Commenced, Dehradun, 1 December 2021 - 28 February 2022.

The XXXVI Certificate Course in Wildlife Management started on 1 December 2021. Sixteen officer trainees of Range Forest Officers and equivalent levels (seven from Madhya Pradesh, five from Maharashtra, and two each from Andhra Pradesh and Uttarakhand) joined the training course at WII.

This flagship course of WII was delayed by one month this year due to the global pandemic. The total training period of the course comes to about 90 days. Of these, nine weeks were spent learning the theoretical basis of wildlife management and participating in seminars, class lectures, examinations etc. In comparison, the remaining four weeks were spent on field tours in the various Protected Areas. The Management tour was conducted in Assam, Arunachal Pradesh, West Bengal and the Andaman Islands during 5-22 February 2022.

All the officer trainees have completed the certificate course, with eight receiving honours certificates for securing 70% and above marks. Smt. Shivangi Dimri, a Range officer trainee from Uttarakhand state, received a Gold medal for the "Institute's Best Trainee" award and Smt. Smriti Suman Jha, Range Officer from Madhya Pradesh, received the Silver medal for the "Best All-round Wildlifer" performance. The chief guest, Shri Vinod Kumar, IFS and Dr Dhananjai Mohan, IFS, Director, WII, presented the Certificates and medals to the officer trainees.

Capacity Building & Professional Exchange

Workshops, Seminars, Conferences and Meetings Organised by WII personnel

First Meeting of the 'Scientific and Technical Advisory Group for the Compilation of the Environmental Accounts in India, Dehradun, 5 April 2021.

The First Meeting of the 'Scientific and Technical Advisory Group (STAG) for compilation of Environmental Accounts in India' was held under the Chairmanship of Shri Sanjeev Sanyal, Principal Economic Advisor, DEA, Ministry of Finance, Govt of India through virtual mode, wherein 25 members of the STAG attended the meeting. Additional Director General (ADG), Social Statistics Division (SSD), Ministry of Statistics and Programme Implementation (MoSPI), welcomed all the participants to the meeting and briefed the members about the work related to environment statistics and accounts being undertaken by MoSPI.

A brief presentation was made by MoSPI on the steps taken in the direction of Environmental Accounting. It was informed that under the UN-led project on "Natural Capital Accounting and Valuation of Ecosystem Services", a study was conducted by the Indian Institute of Science (IISc), Bengaluru, in 8 districts of Karnataka covering different ecosystems. The Chairman, Shri Sanjeev Sanyal, requested the members to send additional comments on the proposal, including the district-level studies, if any, to SSD so that the following steps could be initiated for the award of the studies. He also suggested that the work on the development of methods could start simultaneously.

7th course on wildlife conservation for wildlife enthusiasts, Dehradun, 5-14 April 2021. The 7th course on wildlife conservation for wildlife enthusiasts targeting professionals without any formal training and experience in wildlife biology/conservation was first held in March 2020. However, after the first day of the course then, it had to be cancelled due to the COVID pandemic lockdown restrictions. This course was then held in person at WII from 5-14 April 2021, and 12 participants attended (10 men and two women). The programme's objective was to educate and make aware of the various issues and challenges in wildlife conservation in the country.

The course involved four lecture-based sessions at WII and was delivered by WII faculty and experienced researchers covering Indian biogeography, wildlife conservation issues and strategies across the country, science and management of large mammal populations, biodiversity conservation in the Indian riverscapes, recovery program for endangered species, illegal trade of wildlife parts and role of forensic science, the importance of citizen science initiatives. The participants were taken on a day trip to Benog Wildlife Sanctuary in Mussoorie and then on a five-day field visit to Kotdi Range in Lansdowne Forest Division. The participants were taken on long treks along the Kollu river there and were introduced to natural history observations, jungle crafts etc. They were also informed about wildlife management and habitat restoration, estimation of the tiger population, socio-economic issues and challenges facing PA managers.

World Heritage Day 2021 Celebrations, 18 April 2021.

18th of April is celebrated worldwide as World Heritage Day. On this occasion in 2021, the WII-C2C organized a series of online events to commemorate the occasion. The COVID lockdown restrictions prevented a gathering of heritage enthusiasts in person, but virtual participation was sought in artwork and photography on a range of themes, including Nature-Culture Linkage, Heritage & Me, Mesmerizing Nature, Natural Heritage and Associated Threats. The subsequent entries brought forth several ideas which reflected the splendour of natural heritage and artistic expressions of the need to care for it. The different categories of submission from junior school to postgraduate researchers added a layer of variety to the competition reflecting the perceptions of heritage in a large cross-section of those on whom the future of conservation depends.

Webinar on CBD Indicators for Genetic Diversity of All Species for Post 2020 Global Biodiversity Framework (GBF), Dehradun, 22 April 2021.

Professor Linda Laikre, Professor, Deputy Head of Department, Head of Division of Population Genetics, Director of Studies in Population Genetics, Department of Zoology, Stockholm University, organized a webinar on CBD indicators for genetic diversity of all species for post-2020 global biodiversity framework on 22 April 2021 from 1130-1330hrs. This webinar was organized to present the three indicators developed for measuring genetic diversity in post-GBF 2020. A group of conservation genetics scientists developed these three indicators. Their focus is on the role of genetic diversity in the adaptive potential and long-term survival of species

and ecosystems. They provide advice and a way forward for genetic diversity to the ongoing CBD process with the post-2020 framework. Post-2020 GBF includes genetic diversity in their goals and targets but no measurable indicators. Therefore, this group developed three indicators to measure genetic diversity.

Webinar on Biodiversity Means Business Industry, Dehradun, 27 April 2021.

Wildlife Institute of India participated in an online meeting on the topic 'Biodiversity Means Business Industry' conducted by India Business & Biodiversity Initiative (IBBI) in collaboration with the European Union (EU) and Confederation of Indian Industry (CII) on 27 April 2021. The meeting was co-hosted by Dr Leena Pishe Thomas, Director of Global Business Inroads (GBI). This meeting was conducted for members of IBBI. In the meeting, members of IBBI, such as Tata Steel, JSW Steel, ITC, Nestle and others, shared case studies on their implementation of best practices. The major focus of the work related to business drives the landscape restoration approach. Shri Prabir Deshmukh from IBBI informed that IBBI is the agency to represent biodiversity and business in CBD and under which there is a 10-point declaration on the environment.

Meeting with CPPGG to discuss the projects on Biodiversity Accounting and Ecosystem Services, 28 May 2021.

A meeting was organized between WII and the Centre for Public Policy and Good Governance (CPPGG) on 28 May 2021 to discuss the projects of mutual interest relating to biodiversity and natural resource accounting. WII and CPPGG have already signed an MoU recently for biodiversity accounting-related work. In the meeting, a brief presentation was made by Dr Nasim Ahmad, Project Scientist, on the project proposal submitted by WII to CPPGG on 'Economics of biodiversity, Eco-system services and its cross-sectoral linkages with Sustainable Development Goals (SDGs) for the State of Uttarakhand'. Dr Manoj Pant, the Additional CEO of CPPGG, appreciated the proposal and requested to coordinate with Forest and Environment Department to work in collaboration, and Additional subjects like green budget, biodiversity financing, and ecosystem services may also be included. In the end, it was committed to CPPGG that this proposal would be taken soon through approval in the executive committee meeting.

Virtual meeting with MEE Chairpersons to discuss the field plans of MEE of 210 PAs, Dehradun, 4 June 2021.

Wildlife Institute of India organized a virtual meeting with chairpersons to discuss field plans and progress made in the MEE process. WII and the Ministry of Environment organized it, Forest and Climate Change, Govt. of India. A total of 20 participants attended the meeting. Dr Dhananjai Mohan, Director, WII, opened the meeting and was concerned about the well-being of all the MEE team members in this COVID-19 pandemic. The chairpersons have informed their tentative travel plans and committed to completing the field visit before December 2021. Some of the chairpersons expressed happiness in using the MEE web application for the submission of evaluation results.

Hindi Pakhwada Celebrations at WII, Dehradun, 14-28 September 2021.

The Hindi Pakhwada (fortnight) was celebrated with full enthusiasm and commitment at the Institute. The banner of Hindi Pakhwada was displayed at the Institute's main gate. The standees were displayed having quotations on the 'Importance of Hindi' by our country's great leaders and eminent personalities. The messages and videos in Hindi contributed by the faculty members and staff were also uploaded on the website of the Institute during this period. Four useful forms were made bilingual for the benefit of the staff.

On 27 September 2021, many activities were organized by the VRKS of the Institute. Hindi Officer and Library & Information Officer of Archaeological Survey of India, Dehradun, Dr Shiv Nandan Pandey, was invited to deliver a lecture on this occasion. Dr Pandey discussed the history, importance and present status of Hindi at length. Dr V.P. Uniyal, Scientist-G, made a presentation on 'Use of Insects for Fashion Design' in Hindi. Ms Nidhi Rana, Researcher, also made a presentation on the 'Importance of Firefly in the Ecosystem' in Hindi. The participants highly appreciated both of these presentations.

A quiz in Hindi was organized for the staff and the officers of the Institute, in which almost all the participants attempted the questions and received prizes. The live streaming of the programme was also done on the website of the Institute.

Skill Development Workshop - I for Tour Guides in Great Himalayan National Park Conservation Area, Himachal Pradesh, 22-25 July 2021.

The WII-C2C organized a "Skill Development Programme for Naturalist/Tour Guides of Great Himalayan National Park Conservation Area". The venue was the Park's Sairopa Office in Kullu (HP), where a series of technical sessions by Wildlife Institute of India faculty, WII-C2C personnel and resource persons from the Indian Institute of Tourism & Travel Management, Gwalior led the participants through the role and requirements of a naturalist/ tour guide. Tourist guides are often visitors' immediate points of contact in a place and play an important role in disseminating authentic information leaving lifelong impressions, and influencing travellers' behaviour and opinions of a destination. To be able to play their role fully, guides working in the World Heritage Site of GHNPCA need to understand the unique values of this natural heritage site and learn methods to conduct guided tours in a professional manner in keeping with international standards. These workshops enhanced their capability to provide tourists with the experience they seek from visiting the GHNPCA. Thirty participants benefited from the workshop, including tour guides, local home stay owners, and Himachal Pradesh Forest Department officials.

IUCN World Conservation Congress Webinar, 5 September 2021.

As part of the IUCN World Conservation Congress being held in Marseille, WII-C2C co-hosted a Thematic Streaming Session with the University of Tsukuba titled "Linking Nature and Culture in Asia and the Pacific: Initiatives for Advancing Knowledge and Scaling-up Capacity Building in Landscape Conservation". The session offered an opportunity for heritage practitioners to learn from and contribute to two different initiatives on linking nature and culture in Asia and the Pacific, both aimed at improving the conservation and management of landscapes at national, local and site levels. The UNESCO Chair on Nature-Culture Linkages in Heritage Conservation at the University of Tsukuba, Japan, and the WII-Category 2 Centre presented two international projects, one on capacity building and the other on case studies, which showcased how heritage practitioners from both sectors have been collaborating and sharing knowledge in landscape conservation. Mr Anuranjan Roy, WII, gave a presentation on "Nature and Culture - Clarifying Connections". Dr Dhananjai Mohan, Director, WII, discussed as a panellist how the only way to successfully conserve nature is by including the people component.

Forest Governance vis-a-vis interface of Forest, Wildlife and Biodiversity Laws, 23-24 September 2021.

WII Wildlife Policy Research Cell, WII-C2C and WII ENVIS Cell jointly organized an in-house training of WII project personnel and researchers on 'Forest Governance vis-a-vis interface of laws related to Forest, Wildlife and Biodiversity'. The objective was to familiarize the attendees with the intricacies and jurisdiction of India's various environmental and forest laws. In sessions and discussions over two days, Dr Monali Sen, Registrar, WII and Dr K. Sivakumar, Scientist F, WII, led presentations on the Wildlife (Protection) Act, Forest Rights Act, Environment (Protection) Act, Biological Diversity Act, Indian Forest Act among others for the benefit of nearly 20 participants.

One-Week Special Course on Wildlife Protection, Law and Forensic Science for Officer Trainees of Indian Revenue Service (Customs & Indirect Taxes), Dehradun, 20-25 September 2021.

The Wildlife Institute of India conducted a one-week special course on 'Wildlife Protection, Law and Forensic Science' for Officer Trainees of Indian Revenue Service (Customs & Indirect Taxes) Group-A, 71st Batch, held during 20-25 September 2021. A total of 29 IRS officers participated in the course. The course had a formal inaugural session on 20 September 2021, which the Smt graced. Tilotama Varma, IPS, Addl. Director, WCCB, New Delhi, as Chief Guest.

The course provided extensive input on forensic science and its relevance in combating Wildlife crime. The training was conducted with theoretical inputs as well as practical exposure to wildlife articles for the explanation of the identifiable features

of the articles. The trainees were taken to the field to an elevation range of 2,000-2,500m in Himalayan hills for practical exposure to the flora of the ecosystem along Surkanda Devi hill. They were also taken to the GST Office, Dehradun, to interact with the Officers. The participants were taken to the Corbett Tiger Reserve, Ramnagar, where they interacted with the Park Manager and visited the Reserve to understand the challenges in the protection of animals from poachers. Overall feedback on the course was excellent.

IUCN-ICCROM Heritage Place Lab, September - November 2021.

WII-C2C is part of a mixed team of researchers and practitioners selected for the inaugural Heritage Place Lab initiative within the ICCROM-IUCN World Heritage Leadership Programme (WHL). The team will develop over a span of six workshops scheduled in 2021 and 2022, a practice-based research agenda with the possible funding for implementation. Four virtual workshops were held during September-November, 2021, where WII-C2C represents the team's natural heritage perspective.

Spearhead Training Programme for Ganga Task Force and Eco-Task Force on Biodiversity Conservation of Ganga River & its Tributaries, Dehradun, 27 September - 2 October 2021.

Under the Wildlife Institute of India-National Mission for Clean Ganga project 'Biodiversity Conservation Initiative, a 6-day training programme for the spearhead team of the Ganga Task Force (GTF) & Eco Task Force (ETF) from the Ganga river basin was conducted at the Wildlife Institute of India (WII). The objective of the training was to train the GTF & ETF personnel, who will lead the conservation activities in their respective areas especially conducting cleanliness and plantation drive, volunteering with State Forest Departments in population estimation and different aquatic species of Ganga River basin and mobilisation of school children, local communities, youth, local club etc. The training was attended by 25 personnel of the

Ganga Task Force & Eco Task Force with their Territorial Army Wing of Indian Army units established at Uttarakhand & Uttar Pradesh, respectively. The training programme aimed at building the capacities of the Ganga Task Force and Eco Task Force on various dimensions of conservation aspects, including restoration, rejuvenation and management of Ganga River and its tributaries.

The participants were taken to Asan Conservation Reserve, Haiderpur Wetland, Bijnor and Himalayan Environmental Studies and Conservation Organization (HESCO) for field exposure and hands-on training.

Skill Development for Tour Guides in Great Himalayan National Park Conservation Area, Kullu, Himachal Pradesh, 2-5 October 2021.

WII-C2C organised a "Skill Development Programme for Naturalist/Tour Guides of Great Himalayan National Park Conservation Area" at the Sainj Offices in Kullu. It included a series of technical sessions by WII faculty and resource persons from the Indian Institute of Tourism & Travel Management (IITM)), Gwalior, on the values of the site and the role and requirements of a naturalist/ tour guide. Two batches of 30 participants each benefited from the workshop, including tour guides, local homestay owners, and officials from the Himachal Pradesh Forest Department.

Teacher's Training Programme on World Heritage at Nanda Devi National Park, Joshimath, 4-5 October 2021.

WII-C2C conducted a workshop on "Safeguarding Natural Heritage through Education, Awareness and Network Building among Teachers and Students" at Joshimath, Uttarakhand. The workshop aimed to build the capacity of teachers on the various aspects associated with the Nanda Devi and Valley of Flower World Heritage Site. A series of lectures was conducted on the role of teachers in heritage

conservation, basic concepts of World Heritage, the importance of biodiversity documentation and a practical session on natural heritage monitoring. A total of 15 teachers participated from 10 different schools within the 5 km buffer of the World Heritage Site.

Establishment of Central Asian Flyway (CAF) Secretariat in the Centre for International Conventions (CIC) at the Wildlife Institute of India and meeting to Strengthen the Conservation Actions for Migratory Birds and their Habitats in the Central Asian Flyway, Dehradun, 6-7 October 2021.

The Wildlife Institute of India, with the support from MoEFCC, Govt. of India and in collaboration with the Secretariat of Convention on the Conservation of Migratory Species of Wild Animals (CMS Convention or Bonn Convention), organised a workshop at MoEFCC, New Delhi. The workshop was attended by key organisations working on migratory Birds at the National and International levels. It was officially decided to establish the Central Asian Flyway (CAF) Secretariat within the Centre for International Conventions (CIC) at the Wildlife Institute of India.

***Vigyan se Swaavlamban:* A Synergistic Alliance of Sustainable Rural Technologies and Biodiversity Conservation of Ganga River Basin for Ganga Praharis, Dehradun, 21-28 October 2021.**

The Wildlife Institute of India, in collaboration with the National Mission for Clean Ganga, is implementing the project 'Planning and management for aquatic species conservation and maintenance of ecosystem services in the Ganga River basin'. This project aims to prepare a science-based aquatic species restoration plan for Ganga River Basin by involving multiple stakeholders. As part of the "Community-based aquatic species.

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conservation and outreach in the Ganga River Basin" component of the project, the eight-day workshop '*Vigyan se Swaavlamban*: A Synergistic Alliance of Sustainable Rural Technologies and Biodiversity Conservation of Ganga River Basin for Ganga Praharis' was conducted. The aim of this workshop was to build the capacities of Ganga Praharis on the use of rural green technologies specific to the Ganga River basin.

Through the rural technology training workshop, the Ganga Praharis got acquainted with rural technologies related to sustainable and climate-resilient agriculture, water conservation, wastewater treatment, food technology and processing, solar energy etc. The Ganga *Praharis* also got hands-on experience through interactions with experts from prime institutions working in green technologies at the grassroots level. 46 Ganga *Praharis* from villages along the Ganga River and its' select tributaries, i.e. Bhagirathi, Alaknanda, Yamuna, Gomti, Kosi, and Ghagra, participated in the workshop. During the workshop, the participants visited model sites developed by various institutions such as Himalayan Environmental Studies and Conservation Organization (HESCO) and Krishi Vigyan Kendra, using rural technologies such as fruit and vegetable preservation and value addition, mushroom production, bamboo production, bio-fertilisers and bio-pesticides, green energy sources such as solar energy, biogas and watermills. They were also trained in the treatment of grey wastewater by

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constructing a treatment site at the WII campus. Ganga Praharis were also taken to the Bijnor field site, where they interacted regarding the conservation and livelihood initiatives taken by local Ganga Praharis. The workshop culminated at Bijnor in the presence of local communities and village panchayat members.

One-Week Online training workshop on Management Effectiveness Evaluation (MEE) of Protected Areas and World Heritage Sites, 25-29 October 2021.

One-week online training workshop on 'Management Effectiveness Evaluation (MEE) of Protected Areas and World Heritage Sites for IFS officers was conducted by WII with support from MoEFCC. WII-C2C conducted sessions on World Heritage, reporting and monitoring mechanisms and the use of Heritage Toolkit for MEE. A panel discussion was held on the subject, including included the Director, WII and other senior officers. The training benefitted 20 forest officers.

All the participants attended all the course sessions with punctuality and a high level of interest. The resource persons also actively engaged the participants during the panel discussion.

Management Effectiveness of Protected Areas and World Heritage Sites for IFS Officers, 25-29 October 2021.

The one-week online training workshop on 'Management Effectiveness Evaluation (MEE) of

Protected Areas and World Heritage Sites for IFS officers was conducted by WII with support from MoEFCC. WII-C2C conducted sessions on world heritage, reporting and monitoring mechanisms and the use of Heritage Toolkit for MEE.

Virtual Meeting with MEE Chairpersons to review the progress of MEE of 210 National Parks and Wildlife Sanctuaries, 12 November 2021.

The objective of the meeting was to review the progress of the ongoing MEE exercise of 210 National Parks and Wildlife Sanctuaries. It was organized by the Wildlife Institute of India and the Ministry of Environment, Forest and Climate Change. A total of 20 participants attended the meeting. The Chairpersons participated in the meeting and briefed about the progress made so far, along with their plans for the completion of work.

Geography Week/ GIS Day, Dehradun, 15-19 November 2021.

On Geography Week / GIS Day, the WII-C2C for Natural Heritage Management in the Asia Pacific hosted a workshop on "Applications of Geospatial Data in Natural Heritage Management" in a Hybrid Mode (offline and online). A gathering of 80 researchers and staff imparted instruction on the basics of GIS, GIS for World Heritage Management, Application of Drone Technology, Google Earth search engine and related applications. A series of presentations on 'The basics of GIS, Available free

courses on GIS, GIS for World Heritage Management, Geostatistics in Stream Networks, and Application of Drone Technology' were made for the participants. A series of 2-3 minute lightning talks delivered by researchers set the tone for the hands-on workshop on the Google Earth Engine. Before concluding, the participants learned to apply the software Python, Circuitscape, Fragstat and Maxent/ Biomod. This event has been conducted for the third consecutive year.

Applications of Geospatial Data in Natural Heritage Management, Dehradun 17-18 November 2021.

The objective of the meeting was to encourage the use of GIS technologies to resolve ecological questions. The meeting was organised by the Institute, in which 80 participants participated. GIS Day celebrations have seen considerable engagement in the preceding two years, and this year, the event built up on it. In addition to GIS applications in wildlife science and ecology, this year's event added the element of natural heritage hosted as it was in the world's only UNESCO Category 2 Centre dedicated to natural heritage (https://bit.ly/wii-c2c). Natural heritage has an aspect of conveying the importance of wildlife conservation to a wider audience, much like maps and GIS help convey critical information in an easy-to-process format.

Previous year's feedback for GIS Day was incorporated in the planning for this year as segments of interest for both beginner, and advanced GIS users were organized. The capacity audiences present at the venue were complemented by consistent online attendance numbers demonstrating the interest that they had in the content being shared. Throughout the two days, the audience had clearly set aside this block of time for GIS in this age of limited attention spans, and that could be said to further the aims of celebrating such an event. It is hoped that in future events, even more audiences can be involved and knowledge of GIS's many advantages reach further.

Webinar on "Bastions of Conservation: Natural Heritage in the Asia Pacific", 18 November 2021.

WII-C2C organized a webinar on "Bastions of Conservation: Natural Heritage in the Asia Pacific". In his extensive talk, the keynote speaker, Mr Guy Debonnet, Chief of Unit - Natural Heritage, World Heritage Centre, UNESCO Paris, began with the international significance of the Convention's 49th anniversary before turning to examples of natural heritage from the Asia-Pacific. He provided an overview of the Outstanding Universal Value (OUV) concept, site reporting and monitoring mechanisms and the factors affecting the sites. Approximately 50 persons from a cross-section of countries of the Asia-Pacific and beyond, including China, Thailand, Bangladesh, South Korea, Bhutan and the UK, attended the webinar.

10th Sustainable Mountain Development Summit, 18-20 November 2021.

The workshop's objective was focused on 'Towards one Health: Making our Mountains Resilient.' Dr Lallianpuii Kawlni presented a paper on "Eco-epidemiology in Risk Assessment Consideration and Challenges.

Webinar on "Bastions of Conservation: Natural World Heritage in the Asia-Pacific", Dehradun, 18 November 2021.

WII-C2C organised a webinar on "Bastions of Conservation: Natural Heritage in the Asia Pacific" on 18 November 2021. The keynote speaker, Mr Guy Debonnet, Chief of Unit - Natural Heritage, World Heritage Centre, UNESCO Paris, shared outstanding examples of natural heritage from the Asia-Pacific while providing an overview of the Outstanding Universal Value (OUV), site reporting, monitoring mechanisms and the factors affecting the sites. Nearly 50 participants attended the webinar, including those from other Asia-Pacific countries.

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Workshop on Capacity Enhancement in Controlling Illegal Killing, Trade and Other Crimes on Elephants, Dehradun, 22-23 November 2021.

This workshop aimed to enable the field officers to improve law enforcement by sensitizing them to state-of-the-art vigilance and surveillance procedures, identification of habitual offenders and their prosecution and rehabilitating marginal poachers. It also aimed at providing exposure to better investigation and prosecution techniques that include gathering prosecutable evidence through appropriate forensic tools using classroom inputs, case studies and field practicals.

The workshop was attended by eighteen field officers (ACF & DCF) working in different Elephant Reserves from 14 states, including two each from Karnataka, Kerala, Uttarakhand and Odisha and one each from Andhra Pradesh, Bihar, Chhattisgarh, Jharkhand, Meghalaya, Madhya Pradesh, Nagaland, Tamil Nadu, Uttar Pradesh, Maharashtra and Uttarakhand. There were 12 resource persons, including six internal resource persons, who handled the technical sessions. The participants opined that the workshop effectively enhanced their understanding and provided an opportunity for them to diversify their skill and gain knowledge and proficiency in managing emergencies arising from the illegal trade of wildlife products. The detailed proceedings of the workshop were prepared, and the same has been submitted to the PE Division.

Workshop on Capacity Building for Managing Human-Elephant Conflict in Multiuse Landscapes, Dehradun, 25-26 November 2021.

This workshop was aimed to enable the field officers to understand the approaches widely used in HEC management, the ecological basis of HEC, case studies on measures that worked across different sites in India and other essential considerations. The workshop was attended by twenty field officers (ACF & DCF) working in different Elephant Reserves from 14 states, including two each from Karnataka, Kerala, Uttarakhand and Odisha and one each from Andhra Pradesh, Bihar, Chhattisgarh, Jharkhand, Meghalaya, Madhya Pradesh, Nagaland, Tamil Nadu, Uttar Pradesh, Maharashtra and Uttarakhand. There were 12 resource persons, including five internal resource persons, which handled the technical sessions. Both days of the workshop were held at the Wildlife Institute of India.

The workshop included theoretical sessions on elephant ecology and behaviour, an overview of human-elephant conflict, drivers of human-elephant conflict, diversity of management strategies to address conflict and a panel discussion that flagged the main challenges and possible future directions. The theoretical sessions were interactive and referenced case studies as applicable. The participants opined that the workshop effectively enhanced their understanding and allowed them to diversify their skills in managing the human-elephant conflict. The detailed proceedings of the workshop were prepared, and the same has been submitted to the PE Division.

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Webinar on "Mangroves of Plenty: Ecosystem Services in World Heritage Sites", Tue, 7 December 2021.

TWII-C2C hosted a webinar on "Mangroves of Plenty: Ecosystem Services in World Heritage Sites". Dr Gautam Talukdar, Faculty In-Charge, WII-C2C, initiated and anchored the webinar emphasising the importance of mangroves as an ecosystem. Dr Shizuka Hashimoto, Associate Professor, University of Tokyo, Japan, spoke on "Exploring Ecosystem Services of Ishigaki, Japan". He provided a brief introduction to the Asia-Pacific Network's (APN) Mangrove Project before detailing the research done on the natural and cultural ecosystem services provided by the mangroves in the popular Japanese tourist destination of Ishigaki Island. Dr Rajarshi Dasgupta, Senior Policy Researcher, IGES, Japan, presented the "Insight into Conservation & Management of Mangroves in Indian Sundarbans". He conveyed the landscape history of the Sundarban Delta before extensively discussing the plausible future scenarios and two studies done in the mangroves for various factors like market forces, climate change, sustainability and non-material values. Around 30 participants from across the Asia-Pacific region participated in the webinar.

Himalayan Research Seminar organised at Wildlife Institute of India, Dehradun, 11 December 2021.

The Institute celebrated International Mountain Day by organising the Himalayan Research Seminar (HRS) on 11 December 2021. This year's International Mountain Day theme was 'Sustainable Mountain Tourism' as declared by the United Nations. The 5th Himalayan Research Seminar of the Wildlife Institute of India was inaugurated by Dr Rajendra Dobhal, Director General, Uttarakhand State Council for Science and Technology, Govt. of Uttarakhand. He also delivered the keynote address in the seminar. Dr Dobhal discussed the issue of melting glaciers in the mountain region. He emphasised encouraging the research to interpret the folklore of mountain regions.

Speaking on occasion, Dr Dhananjai Mohan, Director of the Wildlife Institute of India, said, "The Himalayan Research Seminar has proved to be a very effective means for not only showcasing the Institute's research activities about Himalayan region but also to obtain valuable feedback from several professionals on the quality, content and coverage of research projects conducted by the Institute." There are almost 600 publications published by the Institute to date. Dr S. Sathyakumar, Scientist-G, highlighted the research done by the Institute in the last four decades.

The Himalayan Research Seminar has been an important feature of the Institute. It has proved to be an effective means of providing a platform for discussing the outcomes of research projects about the Himalayan region and their management implications. A total of 13 oral presentations were presented in five technical sessions viz., Ecology of Mountain Mammals; Ecological Patterns; Vegetation Science; Aquatic Ecology; and Climate Change, Conservation Planning & Human-Wildlife Interface. The programme was conducted in both online and offline modes.

Webinar on "Mountains and World Heritage: Fountainheads of Life", 13 December 2021.

In the commemoration of 'International Mountain Day' (celebrated on 11th December every year). Dr Gautam Talukdar, Sc-E, initiated the programme with an overview of the importance of mountains and their notable presence on UNESCO's Natural/ Mixed World Heritage Sites list. Dr Dhananjai Mohan, Director, WII, expressed his pleasure at the occasion where all participants fascinated by mountains come together to learn and appreciate their critical contribution. He further shared his practical experience of managing a mountain World Heritage Site in India. Dr S. Sathyakumar, Sc-G, WII and Keynote Speaker of the day, delved into a comparative analysis of four iconic Himalayan World Heritage Sites - those of GHNP, Nanda Devi and Valley of Flowers, Khangchendzonga and Sagarmatha - with examples of their spectacular

beauty, unique biodiversity and issues affecting their Outstanding Universal Values. About 50 participants, including those based in France, Central America and Myanmar were registered for the webinar.

Two Week Orientation Workshop on Wildlife and Health Management for Field Veterinary Officers of Madhya Pradesh, 13-25 December 2021.

Wildlife Institute of India is supporting the initiative taken by the Madhya Pradesh Forest Department to enhance the capacities of veterinary officers of the Dept. of Animal Husbandry, Madhya Pradesh, through training programs. In this connection, a two-week orientation workshop with funding support from Compensatory Afforestation Fund Management and Planning Authority (CAMPA). The objective of the training was to provide an understanding of various wildlife health issues and sensitize the officer trainees on recent advancements in animal capture, wildlife forensics, captive care and managing animals in distress. The training involved the live demonstration of immobilization, biological sampling and health examination of leopards and the demonstration of Monkey Sterilization procedures. The workshop was attended by 25 participants from Madhya Pradesh Animal Husbandry Department.

WII and DU signed the Memorandum of Understanding, Dehradun, 18 December 2021.

Registrar, Wildlife Institute of India (WII) and Registrar, Doon University (DU) Dehradun signed the Memorandum of Understanding (MoU) on 18 December 2021 for collaborative research and Ph. D. program from the current year (2021-2022). The students from WII, who have appeared in the entrance test conducted by DU and qualified the same, will be treated as students through WII allotted seats for their interview.

Workshop on Welfare and Health Management of Captive Elephants, Agra, 12-14 February 2022.

The Project Elephant and Elephant Cell at the Wildlife Institute of India along with the Uttar Pradesh Forest Department and Wildlife S.O.S., conducted a three-day workshop. This workshop was aimed to enable the veterinary professionals engaged in handling and managing captive elephants to understand routine husbandry, health and disease management, nutritional management, neonatal care and musth management. The workshop was attended by twenty-five veterinary officers from 16 states, including three from Uttar Pradesh, two each from Bihar, Karnataka, Madhya Pradesh, Odisha, Tamilnadu, Uttarakhand and West Bengal and one each from Andhra Pradesh, Chhattisgarh, Delhi, Haryana, Maharashtra, Meghalaya, Nagaland, and Tripura. Technical inputs were provided by 14 resource personnel that were all eminent experts in their spheres of work.

The workshop had 18 technical sessions focusing on a variety of themes that covered elephant biology, basic ecology, nutrition management, foot care, housing and welfare, infectious diseases, musth management, surgical interventions, neonatal care, necropsy procedures, gear and equipment for the saddle, transportation, chemical immobilization, elephant training and operant conditioning, mahout welfare, genetic database management of captive elephants, and legal provisions concerning captive elephant management. In addition to theoretical sessions, there was a field visit to a multi-speciality elephant hospital and camp managed by Wildlife S.O.S., thereby providing a first-hand experience for the participants in understanding the nuances of captive elephant management

Webinar on "Tourism and World Heritage – Maximizing Benefits, Boosting Nature", 22 February 2022.

With the objective of reaching out to a wide diversity of the audience in the context of the 50th year anniversary of the historic World Heritage Convention, focusing on tourism in the World Heritage sites, WII-C2C conducted a webinar on "Tourism and World Heritage – Maximizing Benefits, Boosting Nature" on Tuesday, 22 February 2022 with the keynote address by Mr Lazare Eloundou Assomo, Director, World Heritage Centre (Paris). Mr Assomo spoke about the significance of the natural heritage global framework of sustainable tourism and particularly highlighted the impact of a pandemic on tourism and heritage sites. To an engaged audience, he posed a few key questions on what role can tourism and travel play globally; and how tourism and travel could transition into one of the world's largest sustainable industries? Dr Dhananjai Mohan, Director, WII, highlighted areas in India such as Keoladeo National Park, a Natural World Heritage Site, where a major portion of the local population benefits directly from sustainable tourism and where locals are involved in the management and profits derived from the protected area. Dr Gautam Talukdar summarized the WII-C2C's mission and mandate on World Natural Heritage in the Asia-Pacific region through training, research, information dissemination, and network building. Over 50 participants from the Asia-Pacific and beyond attended the webinar.

WII and the Academy of Scientific and Innovative Research (AcSIR) signed an academic agreement, Dehradun, 7 March 2022.

The Wildlife Institute of India (WII) signed a Memorandum of Understanding (MoU) with the Academy of Scientific and Innovative Research (AcSIR) on 7 March 2022. WII will be recognised as AcSIR's Associate Academic Center for obtaining both M.Sc. and PhD degrees through the agreement. AcSIR was established by an Act of Parliament, viz. the Academy of Scientific Innovative Research Act, 2011. It is also recognised as an 'Institution of National Importance (INI) with a goal to create the highest quality personnel with cross-disciplinary knowledge, aiming to provide leaders in the field of science and technology. AcSIR recognises 53 National Institutes in the country, including all CSIR institutions.

The MoU was signed by the Director of WII, Dr Dhananjai Mohan, and the Director of AcSIR, Dr Rajender S Sangwan, in Dehradun in the presence of other higher officials of both institutions. As part of this MoU, WII scientists will mentor students, who will be recognised as honorary faculty of AcSIR. There is also the future scope of widened programs/activities that may be taken up jointly by

AcSIR and WII, as and when required. Over the last decades, WII's M.Sc. (Wildlife Science) course has emerged as one of the top courses for aspiring wildlife science students in the Asia-Pacific region. The course's next batch will likely commence in August 2022 at WII for the award of the first AcSIR degree.

One-week "Health Management of Captive Wild Animals" course, Dehradun, 21–25 March 2022. Wildlife Institute of India organised a one-week "Health Management of Captive Wild Animals" course. The workshop was inaugurated by Shri Vinod Rishi, Former ADG (Wildlife), in the presence of Dr Y.V. Jhala, Dean, FWS, and faculty members of the Institute. Twenty-two officials (veterinary professionals and forest officials) from Jharkhand, Bihar, Assam, Uttarakhand, Punjab, Kerala, Himachal Pradesh and Assam attended the course.

The course aimed to sensitise the participants on various aspects of ex-situ management and included deliberations by eminent scientists and resource persons.

Wildlife Health Bridge 2021-22

Wildlife Institute of India, in collaboration with the Zoological Society of London (ZSL), Royal Veterinary College, University of Melbourne (UoM) and University of Edinburgh (UoE), had organized the following courses for the veterinary officers of Bihar, Jharkhand, Kerala and Uttarakhand as part of Wildlife Health Bridge 2021-22. These courses were organized over the duration of 3 months: (i) 10 January – 18 March 2022 (IWAH 2021 online mode) - Tutors of various institutions; (ii) 21–25 March 2022 at WII (Health Management of Captive Wild Animals) - WII faculty; and (iii) 28 March – 10 April 2022 at Sariska Tiger Reserve, Rajasthan (Field Course on Interventions in Wild Animal Health) – WII faculty and external resource persons.The objectives of these courses were to enhance the knowledge and skills of veterinary professionals in health management of captive and free-ranging wildlife and field investigations and diagnosis of emerging diseases; enhance knowledge and skills of veterinary faculty in zoological medicine, husbandry and nutrition; improve management of captive and free-ranging wildlife; conduct research on wildlife health on husbandry, nutrition and diseases for improved health of wildlife in captivity and free-ranging.

All three components of Wildlife Health Bridge 2021-22 were attended by 22 veterinary officers – Assam (1), Bihar (5), Himachal Pradesh (2), Jharkhand (10), Kerala (1), Punjab (1) and Uttarakhand (2). Besides, the field component on IWAH held in Sariska was also attended online by 13 Postgraduate students of The Royal (Dick) School of Veterinary Studies, University of Edinburgh.

Teaching inputs were provided on wild animal immobilization, managing animals in distress, Wild Animal translocation: Case studies, Introduction to Wildlife Health Management, and Tropical diseases, besides a live demonstration of immobilization procedures and biological sampling in two Sambar deer, Rusa unicolor.

Insight into RhODIS- population assignment of seized rhino horns to identify their origin, 27 March 2022.
It was organised by SCCS, Cambridge. Indian one-horned rhinoceros face threats of illegal poaching, primarily because of its geographical proximity to the major rhino horn consumer countries, Vietnam and China. The Rhino DNA Indexing System in India (RhODIS-India) is a Ministry lead conservation program. It aims at generating a DNA database of the existing populations to aid convictions in rhino-crime cases and help in population management plans. Through this program, we have established a forensic marker panel which was used in providing scientific evidence to aid in court prosecutions of 17 rhino poaching cases in India. Further, we have generated a database of ~500 rhinos using dung DNA, facilitating population assignment of orphan seized horn to its origin

Attended by WII Personnel

IUCN ICCROM Heritage Place Lab, September 2021.
Proceeding on the path to becoming an important centre for research on nature-culture linkages, WII-C2C is part of a mixed team of researchers and practitioners from Jaipur selected for the inaugural Heritage Place Lab initiative within the ICCROM-IUCN World Heritage Leadership Programme (WHL). Working with representatives from the School of Architecture & Design, Manipal University, Jaipur; Jaipur Municipal Corporation; Jaipur Town Planning Department and Heritage Cell, Jaipur, the team developed through 6 workshops in 2021 and 2022, a practice-based research agenda with the possibility of funding for implementation. Workshops on various themes were held, namely “Models of Research Practice Collaboration”, 13 September 2021; “Knowledge Systems Dialogues”, 4, 6 & 8 October 2021; “Building Collaborative Research Agendas”, 25-27 October 2021; “Partnering for Collaborative Research”, 15-17 November 2021; “Building a Common Practice Led Research Proposal”, 16 & 18 March 2022); and “Publication and Heritage Place Lab Follow up”, 30 April - 1 March 2022). Dr Gautam Talukdar, Faculty In-Charge, WII-C2C and Mr Anuranjan Roy, WHA, WII-C2C, represent the team's natural heritage perspective. This will help WII-C2C to develop sound institutional working relationships for long-term engagement; publish outcomes in scientific journals and World Heritage-related channels

World Heritage Cities Dialogues 2021 on the UNESCO HUL Recommendation! Asia and the Pacific region, 28 October 2021.
WII-C2C presented on "Jaipur HUL Recommendations" at the "World Heritage Cities Dialogues 2021 on the UNESCO HUL Recommendation! Asia and the Pacific region" (Thu, 28 Oct 2021) commemorating the 10th Anniversary of the 2011 Recommendation on the Historic Urban Landscape (HUL) drawing on their expertise in natural heritage experience and ongoing Heritage Place Lab (HPL) initiative with IUCN-ICCROM. This was an online meeting discussing the possibilities and challenges for the implementation of the HUL Recommendation in each world region and city, with a special focus on adaptation and resilience, including National Focal Points, site managers, experts, and key persons from the local administration of World Heritage sites.

Participation in Webinar on "World Heritage City Lab – Management of World Heritage Cities", 13–14 December 2021 and Webinar on "World Heritage City Lab – Historic Cities, Climate Change, Water, and Energy", 16-17 December 2021.
WII-C2C participated in the webinar on "World Heritage City Lab – Management of World Heritage Cities" about general guidance on management systems and governance for World Heritage cities contributing to the implementation of the Historic Urban Landscape (HUL) Recommendation and also participated in the webinar on "World Heritage City Lab – Historic Cities, Climate Change, Water, and Energy", 16-17 December 2021 aiming to identify key challenges and opportunities facing historic cities and settlements – particularly in coastal areas - in relation to climate action.

ACTIVITIES & PROFESSIONAL SUPPORT

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Cells

Information Technology and Geo-informatics Facility

Information Technology, Remote Sensing and Geographic Information System facility is part of almost all wildlife research projects, education and training. The facility is available 24x7 to the faculty members, trainees, researchers, students and collaborators working with the Institute. A large number of desktop computers configured with MS Windows, Linux and specialized analytical software for data processing are made available in the dedicated laboratories.

The computer facility is provided by a wide array of hardware setups connected to the Local Area Network (LAN). There are Intel Xeon servers with Storage Area Network (SAN) and Network Attached Storage (NAS) system for the Internet, Intranet, database management and library automation services. There are more than 400 nodes and 700 users on WII LAN. Wi-Fi connectivity is provided in Hostels, Guest Houses, Classrooms, an Auditorium, Board Rooms and Porta Cabins. The Institute has dedicated and unshared 500 Mbps (fibre) internet leased line connectivity through BSNL.
The Geoinformatics laboratory caters to the research and training program of the Institute. The laboratory is equipped with several high-end workstations, A0 scanner-cum-plotter and software packages viz. ArcGIS, ERDAS Imagine software for landscape-level analysis. A dedicated team provides support and training in IT and Geoinformatics. A module on Remote Sensing, GIS and Landscape Ecology is conducted for students of M.Sc. in Wildlife Science and Officer Trainees of Advanced PG Diploma and Certificate Courses in Wildlife Management conducted by the Institute. Hands-on training is also provided to other graduates, post-graduate students and interns. Open-source software, viz. QGIS, GRASS and R are also used for teaching and training.

Online Facility for Workshop/ Webinar/ Meeting/ Lectures: The IT and RS/ GIS Cell is regularly providing a facility for conducting online meetings, workshops, webinars, and lectures in the Board Room, Auditorium, Porta Cabin and in the users' office desktops of the Institute using online communication software viz. Webex, Video Conferencing Facility.

Upgradation of Internet Leased Line Facility: The unshared internet leased line connection of the Institute has been upgraded from 350 to 500 Mbps by BSNL, the existing internet service provider, without any extra cost.

Implementation of New Internet Communication and email Service on Linux-based Server: The new Internet Communication and email Service on Linux-based Server has been installed with secured and limited Spamming/Spoofing emails and daily Anti-spam report to all email users. The new email service on the new mail server provides 50 GB of space to each user.

As per the mandate of the institute to implement e-Office for efficient and effective correspondence among all the departments/cells of the institute and external offices, viz. sister organisation and Ministry of Environment, Forest and Climate Change etc. In this regard, the email Ids on “gov.in” domain for all permanent employees has been created in consultation with NIC. A further process has been initiated to create VPN connections for all to use the e-Office portal Ministry of Environment, Forest and Climate Change.

Expansion of Data Storage System: Network Area Storage (NAS) of 240 TB capacity (Dell EMC NX3240) has been installed in this Cell for the MEE Project database.

Safety Measures: To contain the spread of the Noval Corona Virus, a user policy is put in place to keep safe distancing in the Computer and GIS laboratory. Also, a strategy is in place for staying safe in the computer user facility.

Application of Geoinformatics in Research Projects: GIS, RS, GPS, and Mobile apps are being used in most of the institute's research projects for wildlife research and conservation. Work is in progress on developing a spatial database on the boundaries of all the national parks, wildlife sanctuaries, conservation reserves and community reserves in the country.

Environmental Impact Assessment Cell

The cell coordinates the advisory support for decision-making at various apex-level committees/courts, including the EAC, FAC, NBWL, SBWL of various states, MoEFCC, State Forest Departments, other line departments of the State governments, Government agencies involved in linear infrastructure development, the honourable NGT, honourable High-courts of the States and the Honourable Supreme Court etc. Since its inception, the Institute has completed over 235 projects/studies/site inspections to provide credible and timely advisory support to the government. The

EIA cell, in particular continues to handle several critical projects often in a tight timeline, but with rigour in approach in providing technical advisory. The Environmental Impact Assessment Cell of WII continue to undertake R&D related studies, provide professional support in capacity building initiatives at WII and other institutions; professional bodies; and Government and Corporate organizations. Efforts of networking with global and regional institutions and collaborations with international agencies also continued to expand and diversify. Following important activities were taken up by the cell: (i) Standardized Terms of Reference (ToR) to assess the Impact of Underground Mining on the forest and other natural resources; (ii) Construction of 2-lane width Paved shoulder and Bridge construction through Sone Gharial Sanctuary at Barhi-Hanumana Raj Marg no.52; (iii) Wildlife Management Plan for Koderma Forest Division of Jharkhand; (iv) Preparation of Wildlife Management Plan in relation to the Diversion of 1007 ha. of forest land for North Koel Dam project in Jharkhand; (v) Development of an Online National Reporting Database Portal for capturing trends and status of key progress and performance indicators on Land Degradation and Desertification; (vi) SC-NBWL directed Site Inspection and recommendation for Laldhang - Chillarkhal Stretch of the Road Passing through the Buffer Zone of Rajaji Tiger Reserve; (vii) Ministry of Power, Ministry of New and Renewable Energy constituted committee to study various aspects for implementation of Hon'ble Supreme court order dated 19.04.2021 on I. A No 85618 of 202 in writ petition (Civil) No 838 of 2019 for "Undergrounding of Power lines in Great Indian Bustard (GIB) Habitats"; (viii) On the request of PWD Executive Engineer, Government of Uttarakhand, submitted the following report after site inspection visit. WII (2021). Site visit report and recommendations on the proposed 200 m double lane RCC bridge on Been River at Ganga Bhogpur for all weather connectivity along Chilla - Pashulok motorway, Yamkeshwar Block, Pauri Garhwal, Uttarakhand. Wildlife Institute of India (EIA cell). Pp.26; FAC directed Site Inspection and recommendation Impact of Extended Reach Drilling (ERD) For Petroleum On Biodiversity of Forest Area; (ix) Diversion of 301.96 ha forest land for the construction of Mp-30 Gandhi Sagar Off Stream Pumped Storage Project (1440 Mw) By M/S Greenko Energies Private Limited, Hyderabad in Neemuch Forest Division, Neemuch District; (x) Promotion of Pumped Hydro Storage Power Projects in AP State – request for review of alternative sites studies for Somasila Pump Storage Project (900 Mw); (xi) SC-NBWL directed Site Inspection and recommendation on proposal for use of 0.788 ha of forest land from Kapilash Wildlife Sanctuary for construction of Budhapank – Salegaon 3rd & 4th Railway line Project, (0-85 Km) road, Odisha; (xii) SC-NBWL directed Site Inspection and recommendation on for rationalization of Karlapat Wildlife Sanctuary, Odisha; (xiii) SC-NBWL directed Site Inspection and recommendation on for rationalization of Karlapat Wildlife Sanctuary, Odisha; (xiv) SC-NBWL directed Site Inspection and recommendation for construction of Dembuen – Bruni Road by CPWD in Dibang Wildlife Sanctuary in Dibang District of Arunachal Pradesh.

Wildlife Extension & Audio Visual

The Cell caters to the needs of various requirements of academic activities. It maintains 16 mm films, video films, CDs/DVDs, and a photo library. During the reporting period, the Cell supported all the workshops, seminars, meetings and courses; visiting classes; guest lectures and celebrations of important days or events.

As part of its information dissemination activities, the Institute prepares four quarterly issues of the e-newsletter of WII. The issues were uploaded to the website of the Institute during the reporting period.

WII at Exhibition themed 'Vigyan Sarvatra Pujyte', New Delhi, 22-28 February 2022.

Wildlife Institute of India participated in an exhibition themed 'Vigyan Sarvatra Pujyate' organised by the Ministry of Culture, Government of India. The Institute showcased its major research activities and publications at the exhibition. A selfie point and a model of fish depicting plastic pollution were the major attraction points at the WII stall. A large number of people, including school students, visited the Institute's stall. Some takeaway and distribution materials were also given to the visitors.

Wildlife Forensic and Conservation Genetics Cell

The Wildlife Forensic and Conservation Genetics (WFCG) Cell was established to strengthen the enforcement of the Wildlife (Protection) Act 1972 of India. The main functions of the Cell include the identification of species from a variety of wildlife parts and products for forensic investigation, along with expanding an already available repository of wildlife reference samples and R&D on newer forensic tools. It is now a recognized laboratory for conducting wildlife forensic research and casework supporting the judiciary process. Besides these, the WFCG Cell plays a role in sensitizing enforcement agencies in crime scene examination and proper

collection of evidence through regular training and workshops. Being a focal agency in the Southeast Asian region, it also provides advanced training for wildlife crime analysis to the scientific organizations of the neighbouring countries. The WFCG cell provides services related to molecular ecology to various ongoing research projects that involve phylogeny, population genetics, genomics and endocrinology.

During 2021-22, the Cell received 330 wildlife offence cases from different enforcement agencies across the country, of which three were from CBI, 35 from honourable Courts, 54 from Customs, 200 from the Forest Department, three from the hospitals and 35 from the Police. An assortment of biological products was received for species identification, and of these, 245 cases contained tissue samples requiring DNA-based techniques, 69 cases required morphometric techniques, and 16 cases required both DNA and morphometric techniques for species identification. The Cell provided reports on species identification for 188 cases, and two summons were received from honourable courts for appearances as an expert scientific witness during this period.

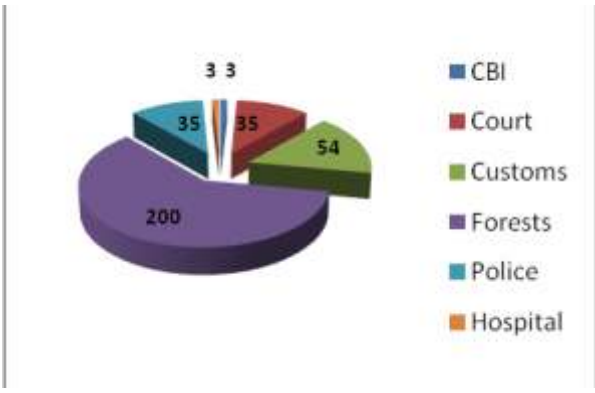

Figure – 1

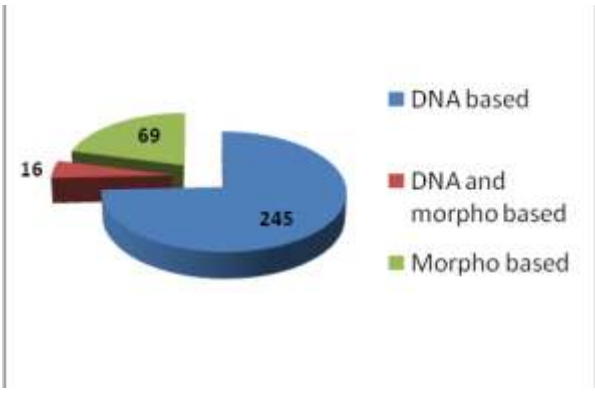

Figure – 2

Specialized inputs were provided in various visiting classes at WFCG Cell. WFCG Cell's experts provided inputs in the workshops organized by the TRAFFIC-India, Wildlife Crime Control Bureau (WCCB) and the regional office of the National Academy of Customs, Indirect Taxes and Narcotics (NACIN) for the training of forests and customs officers in controlling illegal wildlife trade.

The WFGC Cell is involved in conducting research in the field of 'Conservation Genetics and 'Wildlife Endocrinology', where cutting-edge molecular tools are being used to understand species biology. The conservation genomics laboratory also contributes to the objectives of several projects at the institute. Besides, WFCG Cell published peer-reviewed articles for the genetic studies of wild animals.

Library & Documentation Centre

The Library and Documentation Centre (L&DC) of WII plays a vital role in the dissemination of information to a wide range of users, including scientists, researchers and wildlife managers. It was established in line with WII's mission as multidisciplinary information and learning resource centre on biodiversity conservation and management. It has the following objectives: (i) To serve as a repository of all wildlife-related literature published in India; (ii) To acquire, organize and disseminate all relevant literature on biodiversity conservation and related fields; (iii) To serve the user readership through normal and special library & information services; (iv) To establish and maintain links with other national information systems in India and other countries to ensure free flow of information at national and international levels; (v) To serve as a training centre for information personnel and users; and (vi) To bring out periodic updates/bulletins on Current content of periodicals, Research in progress, unpublished research literature, i.e. dissertations, thesis, Compilation of bibliographies on various themes for ENVIS bulletins and database for WII publications.

The L&DC now holds approximately 30,000 books, 8,800 maps/toposheets, and more than 7,500 bound volumes of old and rare journals. The library also maintains a good collection of the scientific paper number to 11,300. The L&DC is fully automated using automation software, i.e. Web-centric LIBSYS 10 (Library Management Software) and RFID technology. All library users, i.e. researchers, officer trainees and faculties, can access online journals and online databases subscribed by the L&DC through Intranet. The users have the privilege to access all in-house databases like books, reprints, Indian wildlife abstracts,

map/toposheet collection, press clippings, specialized bibliographic databases on Musk Deer, Application of Telemetry in Wildlife, Wildlife and Protected Area Management in Madhya Pradesh, Mountain Ungulates, Rainforests Conservation in India, Ungulates of India, Rajaji National Park, Galliformes of India, Freshwater Turtles of India, Telemetry in Wildlife Science, Coastal and Marine Protected Areas of India, WaterBirds of India and Ecology and Management of Grassland Habitats in India, Bibliography on the Fauna and Microflora of the Indian Himalayan Region. The L&DC provides a variety of Library & Information Services to its user.

The infrastructure and physical environment of L&DC is reorganized. RFID technology is implemented in Library & Documentation Centre. Library documents are tagged with RFID chips, and an RFID gate is installed to restrict unauthorized access to library documents. During this period, approximately 15,000 documents were issued and consulted. Value Added Service/ Ready Reference Service was provided to approx. 800 users. Approximately 130 queries were attended by outside users, and more than 3,000 bibliographic references were provided to the users. E-Document delivery service was also provided to outside users during this period. In-house databases were regularly updated during the reporting period. The WII publication database was updated by adding the research papers, thesis, reports, popular articles, papers presented and other categories in this period. Specialized bibliographies were also compiled for different courses and on user request.

WII-ENVIS "Wildlife and Protected Areas"

The objectives of the centre are to (i) Build up information storage, retrieval and dissemination capabilities in subject areas related to wildlife science; (ii) Establish linkages with all information sources in wildlife conservation and management in the country and abroad for increasing the information content; (iii) Respond to user queries by supplying substantive information in the form of published reports, documents, extracts, research papers and other unpublished and analysed information as far as possible; (iv) Maintain links with other ENVIS Centres with the ultimate objectives of identification of data and knowledge gaps in specified subject areas and take action towards filling these gaps Publish bulletins on thematic focus areas; and (v) Publish bulletins on thematic focus areas.

ENVIS Activities 2021-2022: (i) International Day for the Conservation of the Mangrove Ecosystem, 26 July 2021; (ii) Celebration of World Elephant Day, 12 August 2021: (a) Online Photography Contest; and (b) Online Painting and Short Essay Writing Contest; (iii) World Ozone Day, 16 September 2021: (a) Online Poster Making Contest; (b) E-Poster on World Ozone Day 2021; (c) Infographic on World Ozone Day 2021; (iv) Wildlife Week, 2-8 October 2021; (v) Wildlife Week, Webinar Series from 4-8 October 2021: (a) Online Photography Contest; (b) Online Slogan Writing Contest; (c) "What Does Wildlife Conservation Mean to You?" A Short Video Compilation Contest; (vi) Celebration of World Wetlands Day, 2 February 2022; (vii) Webinar on "Wildlife Conservation Photography - Stories from the Wild", 30 January 2022; (viii) Great Backyard Bird Count (GBBC) & Campus Bird Count (CBC), 18-21 February 2022; (ix) Celebration of World Wildlife Day, 3 March 2022; and (x) Certificate Course in Bird Identification and Basic Ornithology under Green Skill Development Programme (GSDP), 21 March - 4 April 2022.

Tiger Cell

In order to achieve the goal of tiger conservation through a holistic approach based on science, the Tiger Cell (in collaboration with the National Tiger Conservation Authority – NTCA) was initiated at WII in April 2016. The main mandates of the Cell include (i) periodic, country-wide assessment of tigers, co-predators, prey and their habitat, (ii) ecological monitoring of the Tiger Reserves, (iii) implementation of MSTrIPES in Tiger Reserves, (iv) site appraisals and evaluation of development projects vis-à-vis tiger distribution, dispersal and corridor network, (v) maintain National Tiger Photo Database for controlling illegal wildlife trade related to tigers, and (vi) provide training as and when required for ecological monitoring, research and management.

Major activities of the Cell during the reporting year include:

(A) Countrywide assessment of tigers, co-predators, prey and their habitat – 5th Cycle;

(B) Monitoring System for Tigers: Intensive Protection and Ecological Status (MSTrIPES);

(C) Management Effectiveness Evaluation (MEE) of Tiger Reserves;

(D) National Repository for Camera Trap Photographs of Tigers (NRCTPT);

(E) Tiger Conservation Plans: (i) Review of Tiger Conservation Plans for Kamlang, Indravati, Periyar, Parambikulam and Ranthambhore Tiger Reserves.

(F) Assessment of developmental proposals: (i) Assessment of 49 developmental project proposals and comments submitted to NTCA for further submission to NBWL and MoEFCC; and (ii) Supervised & coordinated field surveys for Indo-Nepal Border Road project in Uttar Pradesh, prepared final project report.

(F) Evaluation of Eco-sensitive Zones: Assessment of eco-sensitive zones of Periyar, Similiplal, Kali, Namdapha, Ramgarh Vishdhari, Sariska, Mukundara Hills, Phulwari ke Nal.

(G) Training and Capacity Building: (i) Training and capacity building done on all India tiger estimation using MSTrIPES ecological module & polygon search method for approximately 6,400 personnel belonging to state forest departments and conservation partners across India; (ii) Training of biologists recruited for all India tiger estimation project; (iii) Conducted training of IFS Probationers in the Sariska Tiger Reserve; (iv) Conducted introductory class on All India Tiger Estimation and use of MSTrIPES for IFS Officers at IGNFA; and (v) Conducted training workshop for State Forest Research Institute, Madhya Pradesh.

(H) Development of proposals: (i) Corridor assessment in and around Palamau Tiger Reserve; (ii) Tiger carrying capacity in Corbett and Rajaji Tiger Reserves; and (iii) MSTrIPES implementation in Jammu and Kashmir.

(I) Research and technical assistance to NTCA, Government of India and State Forest Departments: (i) Publication of water atlas of tiger reserves in India; (ii) Publication of fire audit protocol for tiger reserves in India; (iii) Drafting a Vision Plan for tiger conservation in India : 2022-2032; (iv) Part of NTCA Committees on proposals for declaring Kumbhalgarh and Dholpur Tiger Reserves in Rajasthan; (v) Part of NTCA Committee for assessment of management effectiveness and biodiversity value of Palamau tiger reserve in compliance to order of Honorable High Court of Jharkhand; (vi) Part of NTCA Committee to assess the suitability for reintroducing tiger(s) in Seljhar area, Mukundara Hills Tiger Reserve, Rajasthan; (vii) Part of NTCA Committee for investigating tiger mortality in Ranthambhore Tiger Reserve, Rajasthan; (viii) Part of MoEFCC Technical Committee for making recommendations for development of alternate potential sites for lions in Gujarat; (ix) Review of Vision Plan for Palamau Tiger Reserve; (x) Technical assistance to NTCA for 4th Asia Ministerial Conference for tiger conservation held at Malaysia and 2nd International Tiger Summit held at Vladivostok, Russia; (xi) Inputs to NTCA for assessing FSI report on change in forest covers in Tiger Reserves; (xii) Inputs to NTCA for Bagh Rakshak Award; (xiii) Inputs to NTCA for workshop on Impact of Eco-tourism/ tourism on Protected Areas: Challenges and, Issues; and (xiv) Regular inputs in review meetings, Technical Committee Meetings, Chief Wildlife Warden and Field Directors' meetings organized by NTCA.

National Wildlife Database Cell

The objectives of the computer-based National Wildlife Database are to (i) Provide readily accessible and comprehensive information on the conservation status of biogeographic regions, habitat types, individual animal species and the network of protected areas in the country; (ii) Establish linkages with researchers, protected area managers and planners and also with other data centres; and (iii) Facilitate research and training activities in wildlife by providing bibliographic references on protected areas, habitat types and animal species.

During 2021-2022, the main thrust of the activities has been on the updation of the databases on Protected Areas, Species and Wildlife Bibliography, based on the collection of current information from various published/unpublished sources during the period mentioned above. The Protected Areas Database of the country has been updated. There are currently 989 Protected Areas, including 106 National Parks, 564 Wildlife Sanctuaries, 219 Community Reserves and 100 Conservation Reserves in the country, covering 1,73,255.31 km2, 5.27% of the total geographical area of the country. Species Database was corrected and updated by adding information on the distribution of mammalian species in various protected areas. Bibliographic Database was updated by adding current literature published on Indian wildlife in various issues of journals/ periodicals during the said period. The Protected Area Network report has been updated by incorporating the latest information. The website of the national wildlife database has been updated further by incorporating the latest information. Nearly one hundred eighty queries were received, and outputs were provided in various desired formats

Herbarium

During the reporting period, herbarium staff provided inputs in various field activities and surveyed protected areas. Approximately 475 plant specimens were identified, which were collected by

research scholars and faculty members from various parts of the country, such as Harike Wildlife Sanctuary, Punjab; Pin Valley National Park, Himachal Pradesh; Rajaji National Park, Corbett National Park, Kedarnath WS in Uttarakhand, and various tributaries of river Ganga.

Campus Development

The construction of the 'Reproductive Control Laboratory', the 'Animal Housing' facility at WII, and the Porta Cabin for Tiger Project staff have been completed. The construction of a stone masonry boundary wall with G.I. chain link fabric fencing in Block III (Phase II) and a scooter shed in Block-I is in progress.

Wildlife Policy Research Cell

Management Effectiveness Evaluation (MEE) of National Parks and Wildlife Sanctuaries, 2021-2022

The objective of the Management Effectiveness Evaluation of 210 National parks and Wildlife Sanctuaries in India during 2021-22. As per approval of the Ministry of Environment, Forest and Climate Change, the Wildlife Institute of India conducted a Management Effectiveness Evaluation (MEE) of 156 National Parks and Wildlife Sanctuaries during 2021-22. The remaining parks were shifted to next year for evaluation. The evaluation was carried out by 20 Independent Regional Expert Committees (MEE Teams). WII made communications with MEE Teams and Chief Wildlife Wardens to accomplish the task. WII organised virtual meetings with MEE Chairpersons to discuss the field plans and review the progress on 4th June 2021 and 12th November 2021, respectively. WII MEE Team has made compilation and analysis of data.

The MEE Teams submitted the filled-in assessment criteria forms for each PA along with a summary, including an introduction, management strengths, management weaknesses and immediately actionable points. Among 156 parks evaluated, 46 PAs in Northern Region, 19 PAs in Southern Region, 34 PAs in Eastern Region, 39 PAs in Western Region and 18 PAs in North-eastern Region were evaluated. WII submitted the report to the Ministry of Environment, Forest and Climate Change of evaluated PAs. The MEE findings suggest indicated areas where more efforts are required, such as involvement of peoples in park management; ecotourism management; capacity building of frontline staff in wildlife management; participatory management and governance (Eco-development); biotic interference; connectivity and corridors; provision of adequate resources.India has institutionalized the system of Management Effectiveness Evaluation (MEE) of Protected Areas in the Country. One full cycle of MEE of all National Parks and Wildlife Sanctuaries has been completed and progressing for the repeat cycle of MEE to monitor the change over a period. India's MEE Score of PAs is more than 60% which is higher than the global MEE score of 56%. By comparing the current MEE score of 156 PAs with the first MEE cycle 2006-19, a 4% improvement has been recorded.

Wildlife Institute of India - Category 2 Centre

The overall objective of the centre is to focus on Natural Heritage conservation issues with the aim to (i) contribute to the strengthening of capacities in the management of Natural World Heritage in the region; (ii) contribute to achieving a more balanced representation of properties from Asia and the Pacific on the World Heritage List; (iii) raise awareness among the general public and the youth in particular of the importance of Natural World Heritage and the need to protect it; and (iv) foster international cooperation on Natural World Heritage initiatives.

Nominations/Dossiers

A key objective of the Centre is to enhance the representation of properties on the World Heritage List. Towards this end, the Centre offers technical support to State Parties in the nomination process of World Heritage Sites. (i) Natural Sites from Madhya Pradesh included in India's Tentative Lists, April 2021. (ii) Consultation Meeting on Gangotri National Park and Kailash Landscape Tentative List Documentation, 24 August 2021. (iii) Garo Hills Nomination Dossier, September 2021. (iv) Meghalaya Biosphere Reserve Documentation, July-September 2021.

Advisory Services

The Centre offers advisory services and technical inputs on World Natural Heritage issues, including for conservation and management of World Heritage Sites, State of Conservation reports, and State Party interventions at World Heritage Centre sessions, among others, to Central and State Governments of India, other countries on request, UNESCO Advisory Bodies and other relevant institutions.

Periodic Reporting - Submission of State Party India Questionnaires, July 2021: WII-C2C continued to be integrally involved with the current Third Cycle of Periodic Reporting for World Heritage Sites of Asia and the Pacific Region from April to July 2021. Training and technical support provided by WII-C2C to Site Managers of 8 natural/mixed World Heritage Sites of India led to the country's successful completion and submission of Periodic Reporting Questionnaires of the sites on the UNESCO online system. The process further helped to strengthen information and enhance the capacity of Site Managers of Natural/ Mixed World Heritage Sites of India.

Archaeological Survey of India Meeting on 'India's Nomination to the World Heritage Committee, 10 December 2021: WII-C2C participated in the virtual meeting, which was organised by the Archaeological Survey of India. The meeting was chaired by the Director General of the Archaeological Survey of India. The objective of the meeting was to discuss various matters related to World Heritage matters and India's role as a newly elected member of the World Heritage Committee. Director, WII as an expert member (Natural Heritage) in the Indian delegation to the Committee, highlighted the significance of natural heritage site requirements, support on World Heritage matters to neighbouring/ friendly countries of India, and the need to ensure effective dissemination of World Heritage documents/ publications to the site level management.

Ministry of External Affairs and WII Meeting on World Heritage Capacity Building, 4 February 2022: A meeting between MEA and WII was held virtually on 4 February 2022 to explore the possibilities of offering development partnership projects to India's existing Global south partners pertaining to Natural Heritage. Discussions were held between Director, WII Shri Dhananjai Mohan and Additional Secretary, MEA Shri Prabhat Kumar, along with supporting personnel from both organisations. The presentation was made by WII detailing the mandate, mission and key activities of WII, along with its functioning as a UNESCO Category 2 Centre (C2C). The deliberations decided that WII-C2C will share further details of select courses and training modules that can be part of the partnership between MEA and WII and offered to other countries on World Heritage thematic issues.

Periodic Reporting - Framework Action Plan Meeting, 22-23 March 2022: As part of the Framework Action Plan Meeting on the Third Cycle of Periodic Reporting in Asia and the Pacific Region hosted by the World Heritage Centre online, WII-C2C took part in the sessions where key outcomes and conclusions of the Periodic Reporting exercise were presented in detail by experts from the World Heritage Centre. WII-C2C was also actively involved in the Asia Sub-Regional Consultation, where it contributed to discussions and inputs in the breakout groups by strategic priorities of the World Heritage Convention to discuss the framework Action Plan with the National Focal Points of the Region for jointly drafting the Action Plan.

World Heritage Working Group Meetings, January – March 2022: In the run-up to the 45th Session of the World Heritage Committee scheduled to be held in Kazan, Russia, in June-July 2022, India, as a member of the Committee was involved in deliberations on a range of issues under consideration by the Committee. Director, WII, as an expert member (natural heritage) of the Indian delegation to the World Heritage Committee, with support of the WII-C2C, was involved in discussions and provision of technical backstopping for various issues through Working Group Meetings organised by the World Heritage Committee during January-March 2022. These include: (i) An online meeting of the Ad-hoc Working Group of States Parties to the World Heritage Convention in conformity with Decision 44 COM 11, 24 January 2022; (ii) A meeting of the Open-ended Working Group of States Parties to the World Heritage Convention in conformity with Decision 44 COM 8, 26 January 2022; (iii) Meeting of the Open-ended Working Group of States Parties to the World Heritage Convention in conformity with Decision 44 COM 8, 23 February 2022; (iv) Meeting of the Open-ended Working Group of States Parties to the World Heritage Convention on the Updating of the Policy Document on Climate Action for World Heritage in conformity with Resolution 23 GA 11, 22 March 2022; and (v) Meeting of the Open-ended Working Group of States Parties to the World Heritage Convention in conformity with Decision 44 COM 8, 24 March 2022.

Research & Monitoring

Plausible alternative futures of Island mangroves in the Asia-Pacific: Scenario-based analysis and quantification of mangrove ecosystem services in coastal hazard mitigation and climate change adaptation in Andaman Island, India

A collaborative research study under a project funded by the Institute for Global Environmental Strategies (IGES), Japan, is being carried out on the mangroves of the Andaman Islands in India to combat the possible adverse impacts of climate

change. Particularly, ecosystem services of mangroves remain at the centre of discussion, considering their exceptional ability to survive in the fragile coastal environment while providing outstanding services such as storm surge control, sediment retention, arresting carbon, etc. A literature review was carried out in the preliminary phase to understand the Mangrove change patterns over time. Presently, work is undergoing on LULC prediction for 2050 using statistical models, ecosystem services modelling, and mapping of ecosystem services like total carbon, blue carbon, etc.

Long-term Monitoring of Outstanding Universal Values (OUV) of Great Himalayan National Park Conservation Area

Himachal Pradesh Forest Department and WII-C2C on Natural World Heritage Management and Training for Asia and the Pacific Region, Wildlife Institute of India Dehradun signed a Memorandum of Agreement (MoA) to conduct a study on “Long-term Monitoring of Outstanding Universal Values of Great Himalayan National Park Conservation Area”. In the preliminary phase, a desktop review of literature, inception meeting and planning workshops were held with the Himachal Pradesh Forest Department. Based on the outcomes of previous meetings, an orientation programme for frontline staff of GHNPCA was organised on-site on 22-23 December 2021. The workshop was inaugurated by Smt. Meera Sharma, Director of GHNPCA, emphasised the importance of the park's values and the need to build the capacity of the frontline staff.

Information Document on Natural and Mixed World Heritage Sites in the Asia and Pacific Region

Presently, systematic information on the status of World Heritage Sites is dispersed among many platforms and national and international organizations, including the World Heritage List. Beyond the high quality of information on the World Heritage Centre website, essential details may also be found in the IUCN World Heritage Outlook, published scientific studies, and State of Conservation Reports (SoC) filed by State Parties on inscribed world heritage sites. The document under preparation, titled "Information Document on Natural and Mixed World Heritage Sites of the Asia and Pacific Region," will provide a snapshot of the already inscribed sites, including major changes such as re-nominations, extensions, or boundary modifications, threats they face, and management initiatives undertaken by state parties and various other agencies. A comprehensive map of all natural and mixed World Heritage Sites in Asia and the Pacific area is also included in the publication. This thoroughly compiled document will vastly increase our understanding of the present state of WHSs and will serve as educational and awareness material for dissemination to stakeholders.

Information on Details of Vigilance Cases for the Year 2021-22 of Wildlife Institute of India, Dehradun

Vigilance Cases as on 01.04.2021	No. of vigilance cases added during the year	No. of vigilance case pending as on 31.03.2022
0	0	0

(Dr Bitapi C. Sinha)
Chief Vigilance Officer

Annual Report of RTI, First Appeal & CIC for the year 01.04.2021 to 31.03.2022

RTI Cases	Opening Balance as on 1st April 2021	No. of new applications directly received from Indian Citizens during 2021-2022	No. of new applications received as transferred from other Public Authorities during 2021-2022	No. of applications transferred to other Public Authorities during 2021-2022	No. of applications as on 31.03.2022	No. of applications rejected during 2021-2022	No. of applications disposed off during 2021-2022	No. of applications not disposed off/ rejected and hence carried forward to next year 2021-2022
(a)	(b)	(c)	(d)	(e)	(f) (b+c+d)-(e)	(g)	(h)	(i)(f-(g+h))
RTI Application	03	90	12	05	100	15	82	03
First Appeal	04	14	00	00	18	00	17	01
CIC Cases	00	01	00	00	01	00	01	00

CPIO (RTI)

VISITORS

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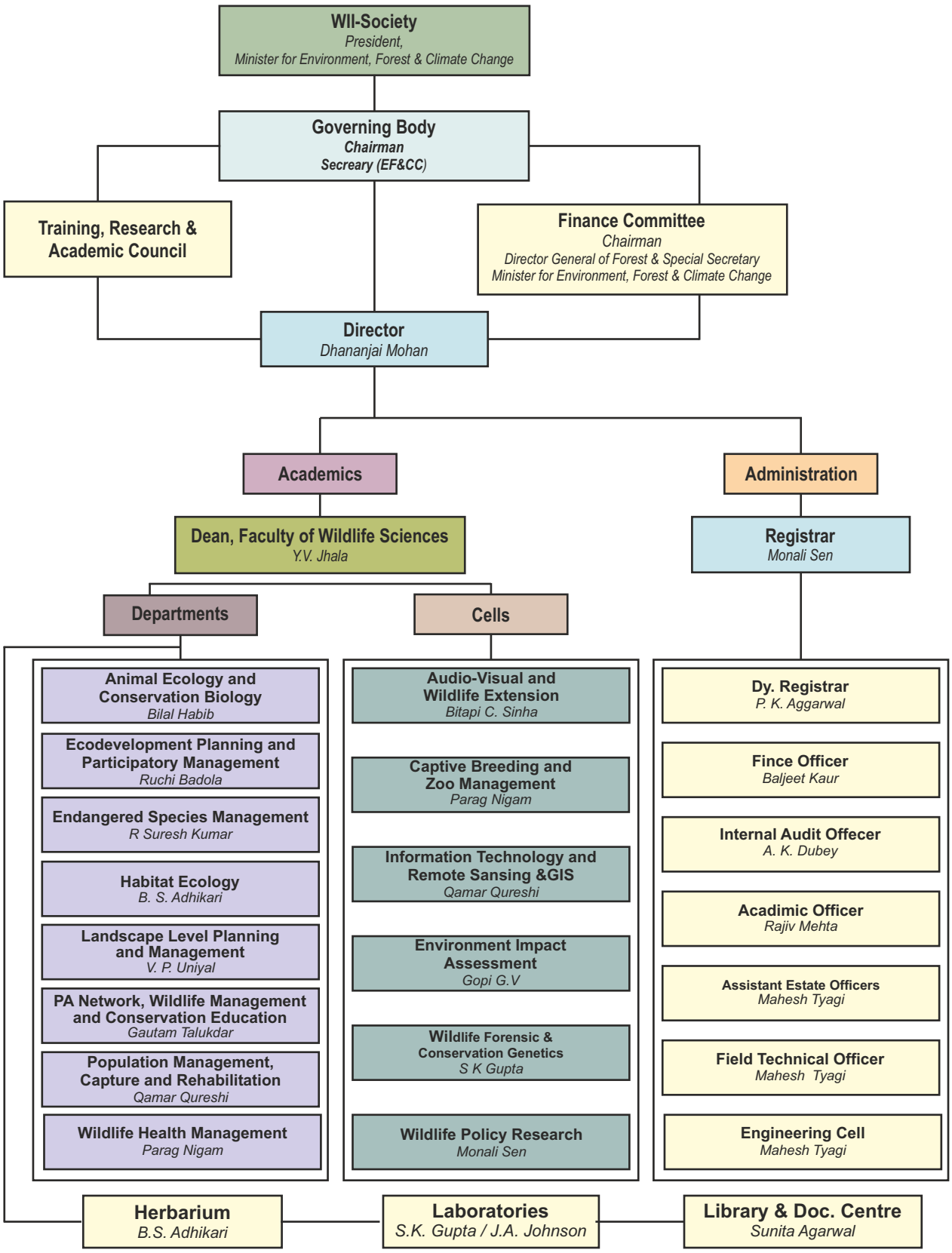
- Range Forest Officers from Tamil Nadu Forest Academy, 7 April 2021.
- Diploma trainees and M.Tech students from IIRS, Dehradun, 8 April 2021.
- SFS officers from CASFOS Burnihat, Assam, 5 July 2021.
- SFS officers from CASFOS Dehradun, 16 August 2021.
- Range Forest Officers from Telangana Forest Academy, 30 September 2021.
- Forest Guards from Forest Training academy, Haldwani, 18 October 2021.
- RFO from Karnataka Forest Academy, Dharwad, 27 October 2021.
- RFO from Karnataka Forest Academy, Dharwad, 11 November 2021.
- Forest Range Officer from Forest Training academy, Haldwani, 18 November 2021.
- RFO from Centre Forest Academy, Coimbatore, Tamil Nadu, 18 November 2021.
- B.Sc. Students (Forestry) Batch from Forest College and Research Institute, Hyderabad, 23 November 2021.
- Department of Botany, Arya PG College Panipat, Haryana, 30 November 2021.
- Virtual visit of students from Madhya Pradesh schools, 4 January 2022.
- Forest Range Officer from Forest Training academy, West Bengal, 11 March 2022.
- Forest Range Officer from Tamil Nadu Forest Academy, 15 March 2022.
- Students from SOAS, DBUU, Dehradun, 28 March 2022.
- Students from IIRS, Dehradun, 29 March 2022.
- IFS Probationers from IGNFA Dehradun, 30 March 2022.

GOVERNANCE

Organizational Structure of WII



Training Research and Academic Council (Period from 10.5.2018 to 9.5.2021)

Chairman

1. Dr H.S. Pabla,
Former PCCF & CWLW, M.P.
E-5 Surendra Garden,
Hoshangabad Road,
Bhopal - 462 028

Members (*Ex-officio*)

2. Director (Wildlife Preservation)/
Additional Director General (Wildlife),
Ministry of Environment,
Forests & Climate Change,
Government of India,
Indira Paryavaran Bhawan,
Jor Bagh, Lodi Road,
New Delhi - 110 003

(3-15) Chief Wildlife Wardens on a regional rotational basis

Northern Region (2 representatives)	Punjab, Chandigarh
Eastern Region (2 representatives)	West Bengal, A&N Islands
Central India (1 representative)	Madhya Pradesh
Western Region (2 representatives)	Gujarat, Maharashtra
Southern Region (2 representatives)	Puducherry, Telangana
North-eastern Region (3 representatives)	Nagaland, Sikkim, Tripura
Permanent Invitee	Uttarakhand

16. Director,
Botanical Survey of India,
Ministry of Environment,
Forest and Climate Change,
C.G.O. Complex, 3 MSO Building,
Block-F, 5th & 6th Floor, DF Block,
Sector-I, Salt Lake City,
Kolkata - 700 064, West Bengal

17. Director,
Zoological Survey of India,
Prani Vigyan Bhawan,
M-Block, New Alipore,
Kolkata - 700 053, West Bengal

18. Member Secretary,
Central Zoo Authority,
Pt. Deendayal Antyodaya Bhawan,
B-1 Wing, 6th Floor, CGO Complex,
New Delhi - 110 011

Members

(19)& (20) Two representatives from University who are Members of WII-Society
Dr Dileep K. Singh,
Professor, Department of Zoology,
University of Delhi,
Delhi - 110 007

Dr A.K. Puri,
155B - Pocket-IV, Mayur Vihar, Phase-I,
New Delhi - 110 091

(21) Dr S. Shivaji,
Research Consultant, Jhaveri Microbiology Centre, L.V. Prasad Eye Institute,
L.V. Prasad Marg, Banjara Hills,
Hyderabad - 500 034, Andhra Pradesh

(22) Dr Pradeep Vyas,
Former Chief Wildlife Warden,
Govt. of West Bengal, Kolkata,
EE-188/4, Sector-II, Salt Lake City,
Kolkata - 700 091, West Bengal

(23) Dr Ajith Kumar,
Director of the Post-Graduate Program in Wildlife Biology and Conservation,
551, 7th Main Road,
Rajiv Gandhi Nagar,
2nd Phase, Kodigehalli,
Bengaluru - 560 097, Karnataka

(24) A Representative of the
Indian Council of Forest,
Research & Education (ICFRE),
P.O. New Forest,
Dehra Dun - 248 006, Uttarakhand

(25) Dean,
Faculty of Wildlife Sciences,
Wildlife Institute of India,
Chandrabani,
Dehra Dun - 248 001, Uttarakhand

(26)& (27) Two senior most Head of Departments (in terms of pay-scale (to be nominated by Director, WII),
Wildlife Institute of India, Chandrabani,
Dehra Dun - 248 001, Uttarakhand

(28) Faculty Member
(In charge of Research Coordination),
Wildlife Institute of India,
Chandrabani,
Dehra Dun - 248 001, Uttarakhand

Member-Secretary

(29) Director,
Wildlife Institute of India,
Chandrabani,
Dehra Dun - 248 001, Uttarakhand

WII-Finance Committee

Chairman

1. Shri Subhash Chandra,
Director General of Forests &
Special Secretary,
Ministry of Environment, Forests and
Climate Change,
New Delhi

Members

2. Shri Praveen Garg
Special Secretary and Financial Advisor,
Ministry of Environment,
Forests and Climate Change,
Indira Paryavaran Bhawan,
New Delhi

3. Dr. Y.V. Jhala,
Dean, FWS,
Wildlife Institute of India,
Dehradun

4. Shri Soumitra Dasgupta,
Additional DG (WL),
Ministry of Environment,
Forests and Climate Change,
Indira Paryavaran Bhawan,
New Delhi

5. Dr. Monali Sen,
Registrar/ Head of Office,
Wildlife Institute of India,
Dehradun

6. Dr. Gautam Talukdar,
Faculty Incharge, WII C2C,
Wildlife Institute of India,
Dehradun

7. Shri Jerome Minz,
Director (FF), IFD,
Indira Paryavaran Bhawan,
New Delhi

Member-Secretary

8. Dr. Dhananjai Mohan,
Director,
Wildlife Institute of India,
Dehradun

PUBLICATIONS

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ACCOUNTS

Separate Audit Report on the Accounts of Wildlife Institute of India, Dehradun for the year 2021-22

1. We have audited the attached Balance Sheet of the Wildlife Institute of India, Dehradun (WII) as at 31 March 2022 and the Income and Expenditure Account and Receipt and Payment Account for the year ended on that date under Section 20 (1) of the Comptroller and Auditor General's (Duties, Powers and Conditions of Service) Act 1971. These financial statements are the responsibility of the WII Management. Our responsibility is to express an opinion on these financial statements based on our audit.
2. This separate audit report contains the comments of the Comptroller and Auditor General of India (CAG) on the accounting treatment only with regard to classification, conformity with the best accounting practices, accounting standards and disclosure norms, etc. Audit observations on financial transactions with regard to compliance with the Laws, Rules and Regulations (Propriety and Regularity) and efficiency-cum-performance aspects, etc. if any, are reported through Inspection Reports/CAG's Audit Reports separately.
3. We have conducted our audit in accordance with auditing standards generally accepted in India. These standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free from material misstatements. An audit includes examining, on a test basis, evidences supporting the amounts and disclosures in the financial statements. An audit also includes assessing the accounting principles used and significant estimates and made by management, as well as evaluating the overall presentation of financial statements. We believe that our audit provides a reasonable basis for our opinion.
4. Based on our audit, we report that :

i) We have obtained all the information and explanations, which to the best of our knowledge and belief were necessary for the purposes of our audit;

ii) The Balance Sheet, Income and Expenditure Account and Receipt and Payment Account dealt with by this report are drawn up in the format as prescribed by the Ministry of Finance, Government of India.

iii) In our opinion, proper books of accounts and other relevant records have been maintained by WII in so far as it appears from our examination of such books.

iv) We further report that:

A. Balance Sheet

1. Assets

1.1 Investment-Others (Schedule 10): Rs.6198.35 lakh

(i) WII did not include its investment of Rs.529.01 lakh (value as on 31.03.2022) in sixteen fixed Deposit Receipt (FDRs) under Assets in Schedule 10 'Investment-Others'. This had resulted in understatement of its Assets and consequents liabilities both by Rs.529.01 lakh.

1 _____

(Amount in Rs.)

Sr.No	FDR NO.	Maturity Value	Amount re-invested	Difference
1	120410	1931087	1842908	88179
2	120411	2758649	2632716	125933
3	120412	2758651	2632718	125933
4	120413	2758651	2632718	125933
5	2719385	791613	764343	27270
6	32052913446	473196	445312	27884
	Total	**11471847**	**10950715**	**521132**

(ii) FDRs(six) related to corpus fund of WII amounting to Rs 114.72 lakh were matured, however the same were renewed at Rs 109.51 lakh, hence, WII realized its investment short by Rs 5.21 lakh[1]. This has resulted in understatement of Assets by Rs 5.21 lakh and understatement of cash/bank balance by the same extent.

1.2 Current Assets (Schedule 11): Rs.9258.21 lakh

(i) WII is maintaining a separate account namely "Miscellaneous Revenue Receipt Account" in which miscellaneous receipts viz. EMD/Security deposit/ caution money etc. were deposited. However, the balance amounting to Rs 315.53 lakh in the said account has been incorporated in the Schedule 11 – bank balances of the Annual Accounts. This had resulted in understatement of current assets by amounting Rs 315.53 lakh as well as understatement of liabilities by the same extent.

B. Income and Expenditure Account

1. Expenditure Rs. 2835.96 lakh

1.1 Establishment Expenses (Schedule-20): Rs. 2036.44 lakh

(i) WII, Dehradun made expenditure of Rs.21.71 lakh in FY 2021-22 towards Other Administrative Expenses (Telephone, Electricity, Internet lease, Newspaper) pertaining to the prior period. This had resulted in overstatement of expenditure by Rs. 21.71 lakh besides understatement of Prior-period Expenses by the same amount.

C. Grant-in-aid:

WII received Grants in Aid of Rs.25.51 crore besides opening balance of Rs. 0.48 crore and other receipts of Rs. 0.63 crore. Out of the total available amount of Rs.26.62 crore, WII made payments of Rs.26.62 crore and an amount of Rs. NIL was closing balance as on 31 March 2022.

D. General

1. Static balances: Audit observed the following static balances under various schedules of the Balance Sheet as on 31 March 2022

Sl. No	Schedule/Head	Balance (in Rs.) as on 31.03.2022	Amount lying since year
1	Sch.7-Current liabilities and Provision Other payments Outstanding (Grant in aid) (2017-18)	121355	2017-18
2	Sch.7-Current liabilities and Provision-Hostel caution money	22000	2020-21
3	Sch.11-Current Assets, Loans and Advances etc- Closing balance of WII publication	298412	2020-21
4	Sch.11-Current Assets, Loans and Advances etc-Advance for Expenses (research projects)	180713	2020-21
5	Sch.11-Current Assets, Loans and Advances etc- Land acquition charges (deposited in Honourable High court)	18000000	2008-09
6	Sch.11-Current Assets, Loans and Advances etc- Advance for IIT Kanpur	1239000	2017-18
7	Sch.11-Current Assets, Loans and Advances-Loan for World Environment Day (MoEF&CC)	280984	2011-12
8	Sch.11-Current Assets, Loans and Advances-Loan for WCF workshop	30253	2012-13

Sl. No	Schedule/Head	Balance (in Rs.) as on 31.03.2022	Amount lying since year
9	Sch.11-Current Assets, Loans and Advances-Advances for Civil Work to CPWD	17830008	Not available with WII
10	Sch.11-Current Assets, Loans and Advances- Advances payment to CCU	15271531	2019-20
11	Sch.11-Current Assets, Loans and Advances- TDS to be refunded buy the ITO (Pension Fund)	4389787	2017-18
12	Sch.11-Current Assets, Loans and Advances- TDS to be Refunded by the ITO (GPF)	2277757	2017-18
13	Sch.11-Current Assets, Loans and Advances - TDS to be refunded by the ITO (Corpus Fund)	2907227	2017-18
14	Sch.11-Current Assets, Loans and Advances-Training cost accrued but not received	660000	1996-2006
15	Sch.11-Current Assets, Loans and Advances-Grant in aid (2017-18)	121355	2017-18

These static balances are long standing in the accounts. As these amounts were required to be released/recovered (as the case may be), efforts may be made by the Institute to settle these balances that were kept pending without any justification. Similar observation was pointed out in previous years' reports also but no remedial action was taken.

E. Effect of revision of Account: Due to revision of account at the instance of audit, the overstatement of both assets and liability has been rectified and reduced by Rs 694.96 lakhs.

F. Management Letter

Deficiencies which have not been included in the Audit Report have been brought to the notice of the Director, WII through a Management Letter issued separately for remedial/corrective action.

v) Subject to our observations in the preceding paragraphs, we report that the Balance Sheet,

Income and Expenditure Account and Receipt and Payment Account dealt with by this report are in agreement with the books of accounts.

vi) In our opinion and to the best of our information and according to the explanations given to us, the said financial statements read together with the Accounting Policies and Notes on Accounts, and subject to the significant matters stated above and other matters mentioned in Annexure to this Audit Report give a true and fair view in conformity with accounting principles generally accepted in India.

a. In so far as it relates to the Balance Sheet of the state of affairs of the WII, as of 31 March 2022 and

b. In so far as it relates to Income and Expenditure Account of the deficit for the year ended on that date.

For and on behalf of the C&AG of India

Place: New Delhi
Date: 10.02.2023

Director General of Audit (ESD)

Annexure-1

1. Adequacy of internal audit system

WII is audited by the Internal Audit Wing of MoEF&CC. Last internal audit was conducted in March, 2022 by MOEFCC for the period 2018-19 to 2020-21. Thus, the internal audit of WII was not conducted for the period 2021-22.

2. Adequacy of internal control system

a. 2010-14 IR, 3 paras of 2014-18 IR and 8 paras of 2018-21 IR) of internal audit.

b. Register of Valuables as per GAR 5 , Accession Register as per GFR 18, Stock Register were not maintained in prescribed format.

c. Signatures of the cashier had not been made on any of the entry in the Cash book. Further, no surprise checks of the cash balance had been conducted and certificate recorded by WII.

3. System of physical verification of fixed asset.

a. WII conducted physical verification of fixed assets procured during FY 2019-20 and FY 2020-21 in August 2021. Complete Physical verification of all assets at WII as on 31 March 2022 was not conducted. Complete and up-to-date physical verification is necessary to ascertain the actual status of fixed assets of the Institute and take follow-up action and also to ensure the correctness of figures depicted in balance sheet.

b. Fixed Assets Register is not being maintained properly. The register is not signed and closed at the year end.

4. System of physical verification of inventory

a. WII did not furnish any report on Physical verification of consumable stores.

b. WII in Feb, 2022 conducted physical verification of books upto 31 December 2021 only. A total of 107[2] number of books amounting to Rs 0.49 lakh[3] were missing from WII library. During the period 2021-22, WII retrieved 24 number of books amounting to Rs 0.12 lakh remaining 83 number of books worth Rs 0.37 lakh are still missing from the library.

5. Regularity in payment of statutory dues

There is no statutory dues pending/outstanding from more than six months

Director (EA)

[2] **28+24+55**
[3] **0.08+0.12+0.29**

Annexure-A

1. Non-renewal of FDRs

During the scrutiny of records related to FDRs, it has been found in audit that 7 numbers of FDRs (Corpus Fund) amounting to Rs 7.29 crore (maturity amount) with period of investment from 21.04.21 to 30.07.21 were matured between 21.04.22 to 30.07.22. However, the same has neither been reinvested/renewed nor encashed which led to the loss of revenue on account of interest to WII.

2. WII utilised Rs.1.12 lakh, from its Grant received for Creation of Capital Assets for repair and maintenance work which is a revenue expenditure. This resulted in understatement of Liabilities on account of unutilized capital grant by Rs.1.12 lakh.

3. Non-Provisioning of Audit fee

both Schedule-7 'Current Liabilities and Provisions' and Achedule-21 'Other Administrative Expenses' of the accounts. Therefore, liabilities as well as expenditure were understated to that extent. This has been pointed in the previous years also, but no remedial action was taken.

4. WII has not maintained separate accounts for GPF & Pension of its employees.0.49 lakh3 were missing from WII library. During the period 2021-22, WII retrieved 24 number of books amounting to Rs 0.12 lakh remaining 83 number of books worth Rs 0.37 lakh are still missing from the library.

5. Understatement of Fixed Assets

lakhs as Closing balance of WII Publication. However, information furnished to audit revealed that WII has balance store and consumable items worth Rs. 1.15 lakhs as on 31.03.2022 which were not included in the Annual Accounts. This has resulted in understatement of Current Assets by Rs. 1.15 lakhs and overstatement of expenditure by the same extent.

6. Understatement of fixed assets

(i) WII made payment of Rs. 3.51 lakh towards procurement of 'Laptop' (Rs. 1.92 lakh), Biometric equipment (Rs. 1.53 lakh) and 'UPS' (Rs. 0.06 lakh) and booked as expenditure which after deduction of depreciation of Rs. 1.01 lakh for the year 2021-22, resulted in understatement of Assets besides overstatement of Expenditure both by Rs. 2.50 lakh.

General: - Non disclosure of Asset procured from sponsored projects.

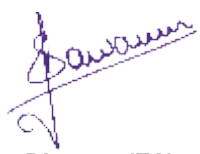
7. Assets procured from earmarked funds prior to 2021-22 has not been included in the above scheduled. Detail of assets procured during previous years may also be included in annexure-2

8. Expenditure Rs. 2835.96 lakh

8.1 Establishment Expenses (Schedule-20): Rs.2036.44 lakh

8.1.1 Overstatement of Expenditure .

(I) WII, Dehradun made salary payment of Rs. 108.81 lakh for March 2021 pertaining to its Group A/B/C staff in April 2021. This had resulted in overstatement of Expenditure by Rs. 108.81 lakh besides understatement of Prior-period Expenses by the same amount.



Director (EA)

Wildlife Institute of India

Receipt & Payment Accounts for the year 2021-22

	RECEIPTS			Previous Year		PAYMENT			Previous Year
Particulars	Plan	Non Plan	Total		Particulars	Plan	Non Plan	Total	
(A) GRANT-IN-AID (General)					Expenses				
To Opening Balance					By Salaries & Allowances	-	-	-	-
Cash in Bank	47,77,475.04	-	47,77,475.04	1,17,81,369.04	By Medical	-	-	-	-
Cash In Hand	-	-	-	-	By LTC	-	-	-	-
					By OTA	-	-	-	-
To Grant in Aid (Revenue)	5,01,05,000.00	-	5,01,05,000.00	3,40,00,000.00	By Honorarium	-	-	-	-
To Grant in Aid (Capital)	-	-	-	-	By Fellowship & Wages (R/Proj)	-	-	-	2,40,915.00
To Grant (other Projects)	-	-	-	32,38,750.00	By Stipend of MSc Students	-	-	-	-
To MSc Course Fee		-	-	41,03,400.00	By Leave encashment & Gratuity	-	-	-	-
To Bus Charges	-	-	-	-	By Bonus	-	-	-	-
To Building Rent+HLF	-	-	-	-	By Fellowship Forenis Cell	-	-	-	-
To WII Products	-	-	-	-	By Base Camp Exp.(Res Project)	-	-	-	58,880.00
To Misc Receipts	15,020.00	-	15,020.00	-	By Vehicle insurance	2,77,525.00	-	2,77,525.00	88,000.00
To Elect & Water	82,686.00	-	82,686.00	-	By Annual Res Seminar-ARS	-	-	-	40,613.00
To Interest on Saving A/c	802.00	-	802.00	787.00	By Estate Security	3,33,51,152.00	-	3,33,51,152.00	63,54,384.00
To Loan & Advance	-	-	-	-	By POL, Hiring of Veh (R/Proj)	-	-	-	1,02,558.00
To EMD Security Deposit	-	-	-	-	By Contingencies (Res Proj)	-	-	-	2,78,479.00
To Hostel Caution Money	-	-	-	-	By Travel Expenses (Res. Proj)	9,299.00	-	9,299.00	4,43,363.00
To Intt on HBA	-	-	-	-	By Lab Expenses-Forc Lab	2,49,733.00	-	2,49,733.00	6,83,161.00
To Travel/FA Adv.-GIA	3,277.00	-	3,277.00	7,87,977.00	By M.Sc Expenditure	12,49,428.00	-	12,49,428.00	17,91,022.00
To Travel Adv.(R/Proj)	-	-	-	1,07,196.00	By Elect and Water Charges	92,63,821.00	-	92,63,821.00	99,16,134.00
To FA (Research Project)	-	-	-	6,41,403.00	By Hospitality/Entertainment	2,44,759.00	-	2,44,759.00	1,24,940.00
To LTC Adv	-	-	-	45,000.00	By POL of WII Vehicle	6,09,739.00	-	6,09,739.00	4,74,816.00
To Medical Adv	-	-	-	39,000.00	By Postage & Telegram	2,07,681.00	-	2,07,681.00	1,92,675.00
To M.Sc-FA & TA Advance	6,01,688.00	-	6,01,688.00	4,78,694.00	By Repair & Maint of Vehicle	2,98,756.00	-	2,98,756.00	5,23,031.00
To Sundry Creditores	-	-	-	4,98,034.00	By Sport	16,350.00	-	16,350.00	1,13,913.00

	RECEIPTS			Previous Year		PAYMENT			Previous Year
Particulars	Plan	Non Plan	Total		Particulars	Plan	Non Plan	Total	
To Expenses for Capitales	21,19,727.00	-	21,19,727.00	-	By Stationery & Consumables	4,54,649.00	-	4,54,649.00	9,05,818.00
To Opening Stock-Library	-	-	-	2,151.00	By Telephone & Trunk Calls	4,99,938.00	-	4,99,938.00	9,96,595.00
To GPF Recd	-	-	-	-	By Legal Expenses	6,60,879.00	-	6,60,879.00	12,60,686.00
To Adv payment CPWD	-	-	-	-	By Operational expenses	14,92,196.72	-	14,92,196.72	10,03,317.00
To Adv Payment CCU	-	-	-	-	By Printing & Binding	4,48,418.00	-	4,48,418.00	40,36,373.00
To Advance for Veh. Ins.	28,121.00	-	28,121.00	84,100.00	By Maint of WII Campus	7,59,190.00	-	7,59,190.00	5,33,253.00
To Campus Development-CPWD	-	-	-	-	By Repair of equip/furniture	1,00,302.00	-	1,00,302.00	40,427.00
To Telephone-Income	-	-	-	-	By Computer AMC & Cons.	10,21,132.00	-	10,21,132.00	24,00,589.00
To Bouns Refund	-	-	-	-	By Lab. Exp-Research Lab	-	-	-	1,66,275.00
To GST	-	-	-	-	By Lab. Expenses-Gen.	-	-	-	-
To CGEGIS	-	-	-	-	By Maint. Of Civil Work	7,85,918.00	-	7,85,918.00	8,04,060.00
To Library Books	-	-	-	12,735.00	By Misc. Receipt Previous Year	42,889.00	-	42,889.00	-
To Internal Loan	2,98,133.00	-	2,98,133.00	-	By Travel Expenses	4,38,349.00	-	4,38,349.00	7,30,102.00
To Medical	-	-	-	-	By Lib expenses	1,42,387.00	-	1,42,387.00	2,99,988.00
To Sub. of ECPF	-	-	-	-	By Computer/ Periphirel	9,28,622.00	-	9,28,622.00	6,05,585.00
To LTC Advance	-	-	-	-	By Furniture & Fixture	-	-	-	18,939.00
To Expenses Payable	14,95,841.00	-	14,95,841.00	-	By Journals & Periodicals	3,370.00	-	3,370.00	1,41,299.00
To Director WII A/c No. 57945	46,625.00	-	46,625.00	-	By Lab Exp-Harberiam	-	-	-	-
To Loan:- D/WII A/c No. 54189	2,53,000.00	-	2,53,000.00	-	By Forest & Tour Adv-GIA	17,276.00	-	17,276.00	3,277.00
					By Medical Adv	-	-	-	-
					By Forest advance R/Proj	-	-	-	1,58,517.00
					By Tour Advance -R/Proj	-	-	-	22,196.00
					By M.Sc. TA Advance	-	-	-	6,01,688.00
					By M.Sc. FA Advance	-	-	-	-
					By Building Complex	-	-	-	-
					By Campus Development	-	-	-	-
					By Vehicle	-	-	-	-
					By Forensic Lab.	5,96,285.00	-	5,96,285.00	91,198.00
					By CGEGIS	82,120.00	-	82,120.00	31,010.00

RECEIPTS				Previous Year	PAYMENT				Previous Year
Particulars	Plan	Non Plan	Total		Particulars	Plan	Non Plan	Total	
					By Office equipment	21,19,727.00	-	21,19,727.00	-
					By Office Eqpt (Res. Proj)	-	-	-	-
					By Camp Eqpt (Res. Proj.)	-	-	-	-
					By GPF-CDL	-	-	-	24,99,780.00
					By GST	468.00	-	468.00	73,523.00
					By TDS	-	-	-	-
					By Prev. Year bal. Transf. to Corpus	-	-	-	34,69,598.00
					By Elect. Equipment	8,409.00	-	8,409.00	-
					By Advance for CPWD	-	-	-	-
					By Advance for CCU	-	-	-	-
					By Sundry Creditors	26,31,954.00	-	26,31,954.00	-
					By Complementry-Library	-	-	-	2,151.00
					By Intt. Refund	-	-	-	38,70,437.00
					By Security Deposit	-	-	-	5,56,968.00
					By Adv for Vehical Ins. Premium	-	-	-	1,33,786.00
					By LTC Advance	-	-	-	-
					By Hostel Causel Money	-	-	-	16,21,795.00
					By EMD Relesd	-	-	-	19,33,158.00
					By New Salary Account	-	-	-	84,000.00
					By Loan:- D/WII A/c No. 58146	25,000.00	-	25,000.00	3,28,360.00
					By Loan:- D/WII A/c No. 54189	61,511.00	-	61,511.00	1,91,489.00
					By Library Software AMC	2,26,265.00	-	2,26,265.00	-
					By Software Renewal- Maintenance	5,01,095.00	-	5,01,095.00	-
					In Bank	802.32	-	802.32	47,77,475.04
					In Hand	-	-	-	-
A' Total	**5,98,27,395.04**	**-**	**5,98,27,395.04**	**5,58,20,596.04**	**A' Total**	**5,98,27,395.04**	**-**	**5,98,27,395.04**	**5,58,20,596.04**

	RECEIPTS			Previous Year		PAYMENT			Previous Year
Particulars	**Plan**	**Non Plan**	**Total**		**Particulars**	**Plan**	**Non Plan**	**Total**	
(A) GRANT-IN-AID (Capital)					By Maint. Of Civil Work	86,863.00	-	86,863.00	2,34,677.00
To Opening Balance					By Furniture & Fixter	-	-	-	5,33,653.00
Cash in Bank	-	-	-	-	By Forest Advance	-	-	-	86,000.00
Cash In Hand	-	-	-	-	By Boundary Wall	-	-	-	40,00,000.00
					By Advance for CPWD	49,59,708.00	-	49,59,708.00	11,53,560.00
					By Misc Contingency	25,429.00	-	25,429.00	-
To Grant in Aid (Capital)	50,00,000.00	-	50,00,000.00	60,00,000.00	By Director WII A/c No. 01	14,000.00	-	14,000.00	-
To Interest (Saving A/c)	-	-	-	7,890.00					
To Forest Advance	86,000.00	-	86,000.00	-					
					In Bank	-	-	-	-
					In Hand	-	-	-	-
A' Total	**50,86,000.00**	-	**50,86,000.00**	**60,07,890.00**	**A' Total**	**50,86,000.00**	-	**50,86,000.00**	**60,07,890.00**
(A) GRANT-IN-AID (Salary)					By Salary	17,96,07,847.00	-	17,96,07,847.00	19,08,09,363.00
To Opening Balance					By Fellowship (Res. Project)	9,09,019.00	-	9,09,019.00	43,94,600.00
Cash in Bank	-	-	-	-	By LTC	3,62,516.00	-	3,62,516.00	1,13,812.00
Cash In Hand	-	-	-	-	By Medical	85,90,880.00	-	85,90,880.00	83,42,536.00
					By Gratuity	4,01,930.00	-	4,01,930.00	91,80,241.00
To Grant in Aid (Salary)	20,00,00,000.00	-	20,00,00,000.00	18,00,00,000.00	By Honorarium	1,23,500.00	-	1,23,500.00	67,000.00
To Bus Charges	82,541.00	-	82,541.00	27,336.00	By Stipend of MSc Students	2,40,000.00	-	2,40,000.00	7,44,000.00
To Electricity & Water	6,83,978.00	-	6,83,978.00	7,29,989.00	By Misc Expenses	-	-	-	-
To HBA Intereset	6,781.00	-	6,781.00	10,000.00					
To House Licence Fee (HLF)	5,04,634.00	-	5,04,634.00	7,55,868.00					
To Loan Dir. A/c No. 4032	-	-	-	2,90,00,000.00	By Loan Dir. A/c No. 4032	69,78,082.00	-	69,78,082.00	-
To Loan Dir. A/c No. 58146	-	-	-	30,44,359.00	By Loan Dir. A/c No. 58146	40,34,435.00	-	40,34,435.00	-
To Advance to General a/c 1297	-	-	-	84,000.00	By Loan Dir. A/c No. 1	32,625.00	-	32,625.00	-
To GPF	2,900	-	2,900.00	-					
					In Bank	-	-	-	-
					In Hand	-	-	-	-
A' Total	**20,12,80,834.00**	-	**20,12,80,834.00**	**21,36,51,552.00**	**A' Total**	**20,12,80,834.00**	-	**20,12,80,834.00**	**21,36,51,552.00**

Receipt & Payment Accounts for the year 2021-22

	RECEIPTS			Previsou Year		PAYMENT			Previous Year
Particulars	Plan	Non Plan	Total		Particulars	Plan	Non Plan	Total	
To Opening Bal (Bank)	14,32,237.00	-	14,32,237.00	13,84,083.00	By Final Payment	1,66,07,622.00	-	1,66,07,622.00	2,87,60,442.00
To Autosweep Bank Bal.	35,00,000.00	-	35,00,000.00	35,00,000.00	By Advance/withdrawl	69,99,966.00	-	69,99,966.00	34,65,290.00
To GP Fund Contribution	2,41,77,879.00	-	2,41,77,879.00	2,87,12,914.00	By Investment of FDR	-	-	-	-
To Encashment of FDR	-	-	-	67,15,531.00	By Auto Sweep Investment	-	-	-	70,00,000.00
To Int. on saving a/c	2,63,675.00	-	2,63,675.00	2,47,324.00					
To Int. on FDR	-	-	-	98,117.00					
					By Closing Balance (Bank)	57,66,203.00		57,66,203.00	14,32,237.00
B' Total	**2,93,73,791.00**		**2,93,73,791.00**	**4,06,57,969.00**	**F' Total**	**2,93,73,791.00**		**2,93,73,791.00**	**4,06,57,969.00**

Receipt & Payment Accounts for the year 2021-22

PENSION FUND

RECEIPTS				Previsou Year	PAYMENT				Previous Year
Particulars	Plan	Non Plan	Total		Particulars	Plan	Non Plan	Total	
To Opening Balance									
To Cash in Bank	11,09,484.00	-	11,09,484.00	31,23,575.00	By Investment in FDR	13,50,00,000.00	-	13,50,00,000.00	17,10,00,000.00
To Encashment of FDR	18,96,58,656.00	-	18,96,58,656.00	3,48,92,247.00	By Commuted Value of Pension	3,48,85,535.00	-	3,48,85,535.00	2,82,58,683.00
To Interest (Pension A/c)	57,37,251.00	-	57,37,251.00	8,15,500.00	By Pension/ Family Pension	3,72,07,024.00	-	3,72,07,024.00	3,02,58,811.00
To WII Contribution	70,98,930.00	-	70,98,930.00	20,02,20,271.00	By Autosweep FD	-	-	-	90,00,000.00
To Interest on FDRs	6,76,450.00	-	6,76,450.00	5,75,385.00					
To Autosweep FD	90,00,000.00	-	90,00,000.00	-					
					Cash in Bank	61,88,212.00	-	61,88,212.00	11,09,484.00
C' Total	**21,32,80,771.00**	-	**21,32,80,771.00**	**23,96,26,978.00**	**D' Total**	**21,32,80,771.00**	-	**21,32,80,771.00**	**23,96,26,978.00**

Receipt & Payment Accounts for the year 2021-22

Corpus Fund

RECEIPTS				Previsou Year	PAYMENT				Previous Year
Particulars	Plan	Non Plan	Total		Particulars	Plan	Non Plan	Total	
To Opening Balance	16,56,641.67	-	16,56,641.67	1,56,83,749.67	By Investment in FDRs	3,80,00,000.00	-	3,80,00,000.00	5,36,54,687.00
To Autosweep Investment	5,00,000.00	-	5,00,000.00	-					
To Misc Receipts	2,13,39,235.18	-	2,13,39,235.18	1,40,00,845.00	By Investment in FDRs	-	-	-	-
To Interests on Saving A/c	6,08,906.00	-	6,08,906.00	2,11,217.00	By Autosweep Investment	-	-	-	5,00,000.00
To Interests on FDR	8,08,945.00	-	8,08,945.00	79,43,027.00	By Misc. & Cont.	-	-	-	590.00
To Encashment of FDR	3,92,55,330.00	-	3,92,55,330.00	23,73,21,599.00	By Pension	-	-	-	19,03,48,519.00
To Loan A/c No. 57945	69,78,082.00	-	69,78,082.00	-	By Loan A/c No. 57945	-	-	-	2,90,00,000.00
					Closing Balance	3,31,47,139.85		3,31,47,139.85	16,56,641.67
D' Total	**7,11,47,139.85**	-	**7,11,47,139.85**	**27,51,60,437.67**	**F' Total**	**7,11,47,139.85**		**7,11,47,139.85**	**27,51,60,437.67**

Receipt & Payment Accounts for the year 2021-22

Training Account

RECEIPTS				Previsou Year	PAYMENT				Previous Year
Particulars	Plan	Non Plan	Total		Particulars	Plan	Non Plan	Total	
To Opening in Bank	1,17,08,105.85	-	1,17,08,105.85	1,56,42,733.85	By Office Equipment	-	-	-	-
To Grant Received	-	-	-	-	By Cont/Misc	4,01,388.00	-	4,01,388.00	2,92,799.00
To Interest Received	3,62,770.00	-	3,62,770.00	4,44,664.00	By Camping Gear	9,65,411.00	-	9,65,411.00	29,123.00
To Other Receipts	1,66,32,000.00	-	1,66,32,000.00	10,56,000.00	By Travelling Expenses	16,85,544.00	-	16,85,544.00	7,35,167.00
To Adv. for Expenses	15,263.00	-	15,263.00	15,33,800.00	By TA/DA & Honorarium	2,74,664.00	-	2,74,664.00	2,83,443.00
To Misc Receipts	-	-	-	-	By POL & Maint of Vehicle	2,52,016.00	-	2,52,016.00	1,76,600.00
To Loan D/WII-54272	-	-	-	-	By Boarding & Lodging	30,24,610.00	-	30,24,610.00	34,64,619.00
To Prepaid Vehicle Insurance	-	-	-	-	By Books	-	-	-	-
To Training Cost Accrued But Not Received	-	-	-	1,78,375.00	By Salary & Wages	8,42,060.00	-	8,42,060.00	5,86,413.00
					By Other Advance	1,47,632.00	-	1,47,632.00	15,263.00

TRAINING ACCOUNT

RECEIPTS				Previsou Year	PAYMENT				Previous Year
Particulars	Plan	Non Plan	Total		Particulars	Plan	Non Plan	Total	
					By Corpus Funds	-	-	-	4,50,000.00
					By Maint of Vehicle	-	-	-	-
					By Sports Item	15,000.00	-	15,000.00	14,040.00
					By Advances for expenses	4,64,146.00	-	4,64,146.00	-
					By Furniture & Fixture	19,000.00	-	19,000.00	-
					By TDS	-	-	-	-
					By Misc. Receipt-Payment	-	-	-	11,00,000.00
					By Closing in Bank	2,06,26,667.85	-	2,06,26,667.85	1,17,08,105.85
E' Total	**2,87,18,138.85**	**-**	**2,87,18,138.85**	**1,88,55,572.85**	**C' Total**	**2,87,18,138.85**	**-**	**2,87,18,138.85**	**1,88,55,572.85**

Receipt & Payment Accounts for the year 2021-22

CONSULTANCY PROJECT

RECEIPTS				Previous Year	PAYMENT				Previous Year
Particulars	Plan	Non Plan	Total		Particulars	Plan	Non Plan	Total	
To Opening Balance:									
at Bank	5,53,93,088.44	-	5,53,93,088.44	3,25,82,870.41	By Office Equipment	20,13,439.00	-	20,13,439.00	20,409.00
To Grant Received	2,26,45,009.00	-	2,26,45,009.00	1,86,82,919.00	By Training Course Materials	3,85,189.00	-	3,85,189.00	-
To Interest Saving A/c	12,88,442.00	-	12,88,442.00	8,16,357.00	By Contingenciges/Misc	10,03,289.00	-	10,03,289.00	10,50,963.00
To Misc Receipt	-	-	-	1,23,13,220.00	By Fellowship & Wages	25,33,444.00	-	25,33,444.00	1,67,195.00
To Advance for expenses	4,20,000.00	-	4,20,000.00	22,20,000.00	By Travel Expenses	18,45,753.00	-	18,45,753.00	6,12,799.00
To Loan D/WII-54272	-	-	-	-	By POL & Maint. of veh.	4,21,289.00	-	4,21,289.00	2,81,088.00
					By Stationery items	14,500.00	-	14,500.00	32,138.00
					By Advance for expenses	1,05,000.00	-	1,05,000.00	2,20,000.00
					By Boarding & Lodging	54,48,449.10	-	54,48,449.10	46,60,331.73

CONSULTANCY PROJECT

RECEIPTS				Previous Year	PAYMENT				Previous Year
Particulars	Plan	Non Plan	Total		Particulars	Plan	Non Plan	Total	
					By TA /DA & Honorarium	12,54,000.00	-	12,54,000.00	1,68,557.00
					By Transf. To Corpus Fund	4,48,323.00	-	4,48,323.00	10,00,687.00
					By Training course fees	-	-	-	7,00,000.00
					By Report writing	2,43,418.00	-	2,43,418.00	28,683.00
					By advance of Other	18,87,800.00	-	18,87,800.00	2,00,000.00
					By Field Equipment	20,73,053.00	-	20,73,053.00	2,00,000.00
					By Refund of Unspend Amt.	26,35,429.00	-	26,35,429.00	16,45,736.00
					By Loan to other Project	-	-	-	-
					By Misc Receipt-Payment	94,88,148.00	-	94,88,148.00	2,33,691.24
					Total Expenditure	3,18,00,523.10		3,18,00,523.10	1,12,22,277.97
					By Bank Balance	4,79,46,016.34	-	4,79,46,016.34	5,53,93,088.44
F' Total	7,97,46,539.44	-	7,97,46,539.44	6,66,15,366.41	E' Total	7,97,46,539.44	-	7,97,46,539.44	6,66,15,366.41

(Baljeet Kaur)
Finance Officer

(Dr. S. P. Yadav)
Director

FORM OF FINANCIAL STATEMENTS (NON-PROFIT ORGANISATIONS)
WILDLIFE INSTITUTE OF INDIA, CHANDRABANI, DEHRADUN
BALANCE SHEET AS ON 31 MARCH 2022

(Amt. Rs.)

CORPUS /CAPITAL FUND AND LIABILITIES	Schedule	Current Year	Previous Year
CORPUS /CAPITAL FUND	1	54,61,12,318.42	51,27,21,428.96
RESERVE AND SURPLUS	2	-	-
ENDOWMENT/EARMARKED FUND	3	80,92,26,481.21	5,53,93,088.44
SECURED LOAN AND BORROWINGS	4	-	-
UNSECURED LOAN AND BORROWINGS	5	2,23,20,051.00	3,20,44,359.00
DEFERRED CREDIT LIABILITIES	6	9,479.00	8,677.00
CURRENT LIABILITIES AND PROVISION	7	38,75,82,804.00	22,62,25,272.00
TOTAL (A)		**1,76,52,51,133.63**	**82,63,92,825.40**
ASSETS			
FIXED ASSETS	8	15,00,99,491.38	16,62,93,640.40
INVESTMENTS- FROM EARMARKED / ENDOWMENT FUNDS	9	-	-
INVESTMENTS- OTHERS	10	64,11,75,253.00	49,22,23,727.00
CURENT ASSETS, LOANS, ADVANCES ETC.	11	97,39,76,389.23	16,78,75,458.00
MISCELLANEOUS EXPENDITURE (to the extent not written off or adjusted)			
TOTAL (B)		**1,76,52,51,133.63**	**82,63,92,825.40**

(Baljeet Kaur)
Finance Officer

(Dr. S. P. Yadav)
Director

FORM OF FINANCIAL STATEMENTS(NON-PROFIT ORGANISATIONS)
WILDLIFE INSTITUTE OF INDIA, CHANDRABANI, DEHRADUN
SHEDULES FORMING PART OF BALANCE SHEET FOR THE YEAR ENDED 31 MARCH 2022

SCHEDULE 1: CORPUS/ CAPITAL FUND		Current Year	Previous Year
Balance as at the begninig of the year		20,73,96,995.29	25,83,62,500.29
Add: Contribution towards Corpus/ Capital fund		36,75,413.00	53,77,939.00
Add/(Deduct) : Balance of net income (expenditure) transferred from		(1,37,96,269.72)	(5,63,43,444.00)
TOTAL	**A**	**19,72,76,138.57**	**20,73,96,995.29**
Corpus Fund			
Opening Balance		30,53,24,433.67	48,88,42,140.67
Received during the year		2,83,17,317.18	1,40,00,845.00
Add Accrued Interest		1,37,76,578.00	1,36,76,313.00
Add Interest Earned		6,08,906.00	2,11,217.00
Intt. On FDR		8,08,945.00	79,43,027.00
Less : Paid to Pension Funds		-	(21,93,49,109.00)
Total	**B**	**34,88,36,179.85**	**30,53,24,433.67**
Total A+B		**54,61,12,318.42**	**51,27,21,428.96**

FORM OF FINANCIAL STATEMENTS(NON-PROFIT ORGANISATIONS)
WILDLIFE INSTITUTE OF INDIA, CHANDRABANI, DEHRADUN
SHEDULES FORMING PART OF BALANCE SHEET FOR THE YEAR ENDED 31 MARCH 2022

(Amt. Rs.)

SCHEDULE 2: RESERVE AND SURPLUS:	Current Year	Previous Year
1. Capital Reserve :		
As per last Account		
Addition during the year	-	-
Less : Deductions during the year	-	-
2. Revaluation Reserve :		
As per last Account	-	-
Addition during the year	-	-
Less : Deductions during the year	-	-
3. Special Reserves :		
As per last Account	-	-
Addition during the year	-	-
Less : Deductions during the year	-	-
4. General Reserve :		
As per last Account	-	-
Addition during the year	-	-
Less : Deductions during the year	-	-
TOTAL	-	-

FORM OF FINANCIAL STATEMENTS (NON-PROFIT ORGANISATIONS)
WILDLIFE INSTITUTE OF INDIA, CHANDRABANI, DEHRADUN
SHEDULES FORMING PART OF BALANCE SHEET FOR THE YEAR ENDED 31 MARCH 2022

SCHEDULE3 : EARMARKED FUNDS	Current Year	Previous Year
a) Opeining Balance of the Funds	63,69,08,114.25	3,25,82,870.41
b) Addition to the Funds		
i Grants Received	73,31,32,891.38	3,09,96,139.00
ii Interest Received	1,83,52,612.00	8,16,357.00
iii Other for Expenses	7,96,78,516.64	22,20,000.00
iv Loan	40,12,600.00	-
v Other Income	13,80,65,046.58	
vi Enscashment of FDR	1,73,97,278.00	
Total	**99,06,38,944.60**	**3,40,32,496.00**
TOTAL (A+B)	**1,62,75,47,058.85**	**6,66,15,366.41**
Utilisation/Expendition towards objectives of funds		
c) i Capital Expenditures (Fixed Assets)		
Camp/Field Equipment	8,06,80,226.72	2,00,000.00
Office Equipment	20,13,439.00	20,409.00
ii Revenue Expenditure		
Contigencies/Misc.	15,06,91,152.22	10,50,963.00
Fellowship & Wages	19,83,02,571.73	1,67,195.00
Travel Expenses	4,09,80,754.93	6,12,799.00
POL & Maint. Of Vehicle	74,02,404.20	2,81,088.00
Advance for Expenses (FA)	3,88,46,367.64	2,20,000.00
Boarding & Lodging	1,26,16,207.20	46,60,331.73
Misc receipt - Payment (Previous Year)	14,02,70,336.08	2,33,691.24
Report Writing	2,78,547.00	28,683.00
Corpus fund	98,31,192.56	10,00,687.00
TA/DA & Honorarium	29,58,175.00	1,68,557.00
Stationery items	14,500.00	32,138.00

SCHEDULE3 : EARMARKED FUNDS	Current Year	Previous Year
Training Course Materials	3,85,189.00	-
Training Course Fee	-	7,00,000.00
Sport Expenses	-	-
Loan to Director WII Other Project	43,18,688.00	-
Refund of Unspend Amt.	1,64,71,077.00	16,45,736.00
Advance for other Firm	18,87,800.00	2,00,000.00
Establishment Expenses	1,19,43,748.00	-
Operational Expenses	9,64,31,907.76	-
Printing and Publication	19,96,293.60	-
TOTAL-C	81,83,20,577.64	1,12,22,277.97
NET BALANCE AS AT THE YEAR-END (A+B-C)	80,92,26,481.21	5,53,93,088.44

FORM OF FINANCIAL STATEMENTS (NON-PROFIT ORGANISATIONS)
WILDLIFE INSTITUTE OF INDIA, CHANDRABANI, DEHRADUN
SHEDULES FORMING PART OF BALANCE SHEET FOR THE YEAR ENDED 31 MARCH 2022

SCHEDULE 4 : SECURED LOANS AND BORROWINGS	Current Year	Previous Year
(1) Central Govt.	-	-
(2) State Govt. (Specify)	-	-
(3) Financial Instittions		
(a) Term Loans	-	-
(b) Interest accured and due	-	-
(4) Banks		
(i) Term Loans		
-Interest accured and due	-	-
(ii) Others Loans (specify)		
- Interest accured and due	-	-
(5) Other Institutions and Agencies	-	-
(6) Debentures and Bonds	-	-
(7) Others (specify)	-	-
TOTAL	-	-

FORM OF FINANCIAL STATEMENTS (NON-PROFIT ORGANISATIONS)
WILDLIFE INSTITUTE OF INDIA, CHANDRABANI, DEHRADUN
SHEDULES FORMING PART OF BALANCE SHEET FOR THE YEAR ENDED 31 MARCH 2022

SCHEDULE 5 : UNSECURED LOANS AND BORROWINGS	Current Year	Previous Year
(1) Central Govt.	-	-
(2) State Govt. (Specify)	-	-
(3) Financial Instittions	-	-
(4) Banks		
(i) Term Loans	-	-
(ii) Others (specify)	-	-
(5) Other Institutions and Agencies	-	-
(6) Debentures and Bonds	-	-
(7) Fixed Deposits		
(8) Others (Specify)		
Security Deposit	-	-
Internal Loan	2,23,20,051.00	3,20,44,359.00
Pension Fund	-	-
TOTAL	2,23,20,051.00	3,20,44,359.00

FORM OF FINANCIAL STATEMENTS (NON-PROFIT ORGANISATIONS)
WILDLIFE INSTITUTE OF INDIA, CHANDRABANI, DEHRADUN
SHEDULES FORMING PART OF BALANCE SHEET FOR THE YEAR ENDED 31 MARCH 2022

SCHEDULE 6 : DEFERRED CREDIT LIABILITIES:	Current Year	Previous Year
(A) Acceptances secured by hypothecation of capital equipment and other assets	-	-
(B) Others	9,479.00	8,677.00
TOTAL	**9,479.00**	**8,677.00**

FORM OF FINANCIAL STATEMENTS(NON-PROFIT ORGANISATIONS)
WILDLIFE INSTITUTE OF INDIA, CHANDRABANI, DEHRADUN
SHEDULES FORMING PART OF BALANCE SHEET FOR THE YEAR ENDED 31 MARCH 2022

SCHEDULE 7 : CURRENT LIABILITIES AND PROVISION	Current Year	Previous Year
(A) CURRENT LIABILITIES		
(1) Acceptances		
(2) Sundry Creditors		
(1) For Goods		
(2) For Others		
Other Payments outstanding (Grant in Aid) (2020-21)	1,83,207.00	28,15,161.00
Other Payments outstanding (Grant in Aid) 2017-18)	1,21,355.00	1,21,355.00
(3) Advances Received		
Hostel Caution Money	22,000.00	22,000.00
(4) Interest accrued but not due on		
(1) Secured Loans/Borrowings	-	-
(2) Unsecured Loans/Borrowings	-	-
(5) Statuary Liabilities		
(1) Overdue		
(2) Others (Specify)		
Pension Fund	20,36,13,105.00	7,08,67,946.00
GP Fund	16,95,18,734.00	15,23,03,362.00
(6) Others (Specify)		
EMD Received	-	-
Loan:- D/WII A/c No. 57945	46,625.00	
Welfare Fund	-	-
TOTAL (A)	**37,35,05,026.00**	**22,61,29,824.00**
(B) Provisions		
(1) For Taxation		
TDS- Training Account		-
GST-Grant in Aid	12,860.00	13,328.00
(2) Gratuity		
(3) Superannuation/ Pension	-	-
(4) Accumulated Leave Encashment	-	-
(5) Trade Warranties/ Claims	-	-
(6) Others (Specify)		
TDS refund paid to GPF, Pension & Corpus	-	-
CGEGIS	-	82,120.00
GPF-CDL	2,900.00	-
Sub. of ECPF		-
Salary Payable	1,34,78,293.00	-
Other Payable	5,83,725.00	
Payment to Income Tax	-	-
Payment made to Sh Rajkishore Mohanto (Res. Projecdt)	-	-
Fellowship (Arrear)	-	-
TOTAL (B)	**1,40,77,778.00**	**95,448.00**
TOTAL (A+ B)	**38,75,82,804.00**	**22,62,25,272.00**

FORM OF FINANCIAL STATEMENTS (NON-PROFIT ORGANISATIONS)
Wildlife Institute of India, Dehradun
SCHEDULES FORMING PART OF BALANCE SHEET FOR THE YEAR ENDED 2021-22
SCHEDULE 8 : FIXED ASSETS

Pariculars	Gross Block						DEPRECIATION				NET BLOCK	
		Addition during the year										
	Cost as at the beginning of the year	Upto 30-Sep	After 30-Sep	Deduction during the year	Adjustment	Cost as at the end of the year	As at the beginning of the year	For the year	Deduction during the year	At the end of the year	As at the current year-end	As at the Previous year-end
LAND												
BLOCK: 0%												
Land	66,07,214.58	-	-	-	-	66,07,214.58	-	-	-	-	66,07,214.58	66,07,214.58
TOTAL	66,07,214.58	-	-	-	-	66,07,214.58	-	-	-	-	66,07,214.58	66,07,214.58
BUILDINGS												
BLOCK: 10%												
Arch. & Sprvson Fee	12,10,765.41	-	-	-	-	12,10,765.41	2,05,044.00	1,21,077.00	-	1,21,077.00	10,89,688.41	12,10,765.41
Auditorium	18,13,084.47	-	-	-	-	18,13,084.47	3,07,047.00	1,81,308.00	-	1,81,308.00	16,31,776.47	18,13,084.47
Boundary Fencing	1,10,490.23	-	-	-	-	1,10,490.23	18,712.00	11,049.00	-	11,049.00	99,441.23	1,10,490.23
Boundary Wall	1,95,360.79	-	-	-	-	1,95,360.79	33,084.00	19,536.00	-	19,536.00	1,75,824.79	1,95,360.79
Boundary Wall-Capital	38,00,000.00	-	-	-	-	38,00,000.00	33,084.00	3,80,000.00	-	3,80,000.00	34,20,000.00	38,00,000.00
Building Complex	5,50,05,808.86	-	-	-	-	5,50,05,808.86	45,04,546.00	55,00,581.00	-	55,00,581.00	4,95,05,227.86	5,50,05,808.86
	-	-	-	-		-	-	-	-	-	-	-
Campus Develop	4,47,20,875.70	-	-	-	-	4,47,20,875.70	52,62,390.00	44,72,088.00	-	44,72,088.00	4,02,48,787.70	4,47,20,875.70
	-	-	-	-	-	-	-	-	-	-	-	-
Tennis Court	71,709.51	-	-	-	-	71,709.51	12,144.00	7,171.00	-	7,171.00	64,538.51	71,709.51
Sports Complex	99,010.46	-	-	-	-	99,010.46	16,767.00	9,901.00	-	9,901.00	89,109.46	99,010.46
Road & Culvert	2,16,970.48	-	-	-	-	2,16,970.48	36,744.00	21,697.00	-	21,697.00	1,95,273.48	2,16,970.48
TOTAL	10,72,44,075.91	-	-	-	-	10,72,44,075.91	1,04,29,562.00	1,07,24,408.00	-	1,07,24,408.00	9,65,19,667.91	10,72,44,075.91
BLOCK: 5%												

Pariculars	Gross Block						DEPRECIATION				NET BLOCK	
		Addition during the year										
	Cost as at the beginning of the year	Upto 30-Sep	After 30-Sep	Deduction during the year	Adjustment	Cost as at the end of the year	As at the beginning of the year	For the year	Deduction during the year	At the end of the year	As at the current year-end	As at the Previous year-end
Staff Quarters	45,98,338.71	-	-	-	-	45,98,338.71	2,97,134.00	2,29,917.00	-	2,29,917.00	43,68,421.71	45,98,338.71
TOTAL	45,98,338.71	-	-	-	-	45,98,338.71	2,97,134.00	2,29,917.00	-	2,29,917.00	43,68,421.71	45,98,338.71
PLANT MACHINERY & EQPT												
BLOCK: 15%												
Vehicle	51,04,261.10	-	-	-	-	51,04,261.10	7,24,615.00	7,65,639.00	-	7,65,639.00	43,38,622.10	51,04,261.10
Elect equipment `	23,85,509.00	8,409.00	-	-	-	23,93,918.00	7,09,707.00	3,59,088.00	-	3,59,088.00	20,34,830.00	23,85,509.00
Foerensic Laboratory	1,08,53,007.66	5,58,254.00	38,031.00	-	-	1,14,49,292.66	7,09,707.00	17,14,541.00	-	17,14,541.00	97,34,751.66	1,08,53,007.66
Training Equipment	9,83,764.80	-	-	-	-	9,83,764.80	3,32,573.00	1,47,565.00	-	1,47,565.00	8,36,199.80	9,83,764.80
Camp Equipment (Project)	74,445.80	-	-	-	-	74,445.80	25,167.00	11,167.00	-	11,167.00	63,278.80	74,445.80
DG Set	34,06,915.39	-	-	-	-	34,06,915.39	1,24,882.00	5,11,037.00	-	5,11,037.00	28,95,878.39	34,06,915.39
EPABX	32,138.86	-	-	-	-	32,138.86	10,865.00	4,821.00	-	4,821.00	27,317.86	32,138.86
Lab Equipment	16,62,619.98	-	-	-	-	16,62,619.98	5,32,968.00	2,49,393.00	-	2,49,393.00	14,13,226.98	16,62,619.98
Office Equipment	17,06,628.07	21,19,727.00	-	-	-	38,26,355.07	2,87,580.00	5,73,953.00	-	5,73,953.00	32,52,402.07	17,06,628.07
Trg Equipment (Trg A/c)	9,71,953.01	-	-	-	-	9,71,953.01	3,10,314.00	1,45,793.00	-	1,45,793.00	8,26,160.01	9,71,953.01
Office Equipment (Trg A/c)	17,41,603.99	-	-	-	-	17,41,603.99	3,48,632.00	2,61,241.00	-	2,61,241.00	14,80,362.99	17,41,603.99
Office Equipment (Project)	3,634.97	-	-	-	-	3,634.97	1,229.00	545.00	-	545.00	3,089.97	3,634.97
Office Equipment (R/Proj)	21,51,649.62	-	-		-	21,51,649.62	4,86,657.00	3,22,747.00	-	3,22,747.00	18,28,902.62	21,51,649.62
Camp Equipment (R/Proj)	41,63,672.85	-	-	-	-	41,63,672.85	10,01,361.00	6,24,551.00	-	6,24,551.00	35,39,121.85	41,63,672.85
TOTAL	3,52,41,805.10	26,86,390.00	38,031.00	-	-	3,79,66,226.10	56,06,257.00	56,92,081.00	-	56,92,081.00	3,22,74,145.10	3,52,41,805.12
AC Plant : BLOCK : 10%												
AC Plant	3,64,423.46	-	-	-	-	3,64,423.46	92,573.00	36,442.00	-	36,442.00	3,27,981.46	3,64,423.46
TOTAL	3,64,423.46	-	-	-	-	3,64,423.46	92,573.00	36,442.00	-	36,442.00	3,27,981.46	3,64,423.46
FURNITURE, FIXTURES : BLOCK : 10%												
Furinitures & Fixtures-GIA	55,81,910.73	-	-	-	-	55,81,910.73	3,52,434.00	5,58,191.00	-	5,58,191.00	50,23,719.73	55,81,910.73
Furinitures & Fixtures-Capital A/c	4,85,238.00	-	-	-	-	4,85,238.00	3,52,434.00	48,524.00	-	48,524.00	4,36,714.00	4,85,238.00

Pariculars	Gross Block						DEPRECIATION				NET BLOCK	
		Addition during the year										
	Cost as at the beginning of the year	Upto 30-Sep	After 30-Sep	Deduction during the year	Adjustment	Cost as at the end of the year	As at the beginning of the year	For the year	Deduction during the year	At the end of the year	As at the current year-end	As at the Previous year-end
Furniture & Fixture (Trg)	2,52,015.59	-	19,000.00	-	-	2,71,015.59	31,228.00	26,152.00	-	26,152.00	2,44,863.59	2,52,015.59
TOTAL	63,19,164.32	-	19,000.00	-	-	63,38,164.32	7,36,096.00	6,32,867.00	-	6,32,867.00	57,05,297.32	63,19,164.32
COMPUTER/PERIPHERALS : BLOCK : 40%												
Comp. and Periphrals	4,12,414.73	-	3,03,028.00	-	-	7,15,442.73	78,554.00	2,25,572.00	-	2,25,572.00	4,89,870.73	4,12,414.73
Comp. & Accessories	30,90,242.71	-	6,25,594.00	-	-	37,15,836.71	6,34,776.00	13,61,216.00	-	13,61,216.00	23,54,620.71	30,90,242.71
E Governance	135.42	-	-	-	-	135.42	2,350.00	54.00	-	54.00	81.42	135.42
TOTAL	35,02,792.86	-	9,28,622.00	-	-	44,31,414.86	7,15,680.00	15,86,842.00	-	15,86,842.00	28,44,572.86	35,02,792.86
BOOKS : BLOCK : 40%												
Journals & Periodicals	21,50,426.26	-	-	-	-	21,50,426.26	31,82,974.00	8,60,171.00	-	8,60,171.00	12,90,255.26	21,50,426.26
LIBRARY BOOK:-BLOCK : 40%												
Library Books	2,65,399.19	-	3,370.00	-	-	2,68,769.19	1,52,363.00	1,06,834.00	-	1,06,834.00	1,61,935.19	2,65,399.19
TOTAL	**24,15,825.45**	-	**3,370.00**	-	-	**24,19,195.45**	**33,35,337.00**	**9,67,005.00**	-	**9,67,005.00**	**14,52,190.45**	**24,15,825.45**
GRAND TOTAL	**16,62,93,640.39**	**26,86,390.00**	**9,89,023.00**	-	-	**16,99,69,053.39**	**2,12,12,639.00**	**1,98,69,562.00**	-	**1,98,69,562.00**	**15,00,99,491.38**	**16,62,93,640.40**

(Baljeet Kaur)
Finance Officer

(Dr. S. P. Yadav)
Director

FORM OF FINANCIAL STATEMENTS(NON-PROFIT ORGANISATIONS)
WILDLIFE INSTITUTE OF INDIA, CHANDRABANI, DEHRADUN
SHEDULES FORMING PART OF BALANCE SHEET FOR THE YEAR ENDED 31 MARCH 2022

SCHEDULE :9 INVESTMENTs FROM EARMARKED/ENDOWMENT FUNDES	Current Year	Previous Year
(1) In the Govt. Securities	-	-
(2) Other approved Securities	-	-
(3) Shares	-	-
(4) Debentures and Bonds	-	-
(5) Subsidaries and Joint Ventures	-	-
(6) Others (Specify)	-	-
TOTAL	-	-

FORM OF FINANCIAL STATEMENTS(NON-PROFIT ORGANISATIONS)
WILDLIFE INSTITUTE OF INDIA, CHANDRABANI, DEHRADUN
SHEDULES FORMING PART OF BALANCE SHEET FOR THE YEAR ENDED 31 MARCH 2022

SCHEDULE :10 INVESTMENT - OTHERS	Current Year	Previous Year
(1) In the Govt. Securities		
(2) Other approved Securities		
(3) Shares		
(4) Debentures and Bonds		
Investment in RBI Bond (GPF)	-	-
Investment in RBI Bond (Pension)	-	-
Investment in RBI Bond (Corpus Fund)	4,20,00,000.00	4,20,00,000.00
(5) Subsidaries and Joint Ventures		
(6) Others (Specify)		
Investment in FDR (GPF)	14,97,84,071.00	13,33,03,117.00
Autosweep FDR-GPF	35,00,000.00	70,00,000.00
Investment in FDR (Pension Fund)	17,98,85,947.00	5,58,36,358.00
FDR Corpus Fund	25,70,05,235.00	24,45,84,252.00
Autosweep FDR Corpus fund	-	5,00,000.00
Autosweep FDR-Pension Fund	90,00,000.00	90,00,000.00
TOTAL	**64,11,75,253.00**	**49,22,23,727.00**

FORM OF FINANCIAL STATEMENTS(NON-PROFIT ORGANISATIONS)
WILDLIFE INSTITUTE OF INDIA, CHANDRABANI, DEHRADUN
SHEDULES FORMING PART OF BALANCE SHEET FOR THE YEAR ENDED 31 MARCH 2022

SCHEDULE :11 CURRENT ASSETS, LOANS, ADVANCES ETC.	Current Year	Previous Year
(A) CURRENT ASSETS		
(1) Inventories		
Closing Stock of Steel & Cement	-	-
Advance paid for Journals (Grant in Aid)	-	-
Closing Balance of WII Publication	2,98,412.00	2,98,412.00
(2) Sundry Debtors		
(1) Debts Outstanding for a period exceeding six months	-	-
(2) Others (Specify)		
(3) Cash balances in hand (including cheques/drafts and imprest)		
Grant-in-Aid A/c	-	-
Training A/c	-	-
Pension Fund A/c	-	-
GPF A/c	-	-
Corpus Fund	-	-

SCHEDULE :11 CURRENT ASSETS, LOANS, ADVANCES ETC.	Current Year	Previous Year
(4) Bank Balances	-	-
(1) With Scheduled Banks		
Grant-in-Aid A/c	802.32	47,77,475.04
Training A/c	2,06,26,667.85	1,17,08,105.85
Pension Fund A/c	61,88,212.00	11,09,484.00
GPF A/c	57,66,203.00	14,32,237.00
Corpus fund No 4032	3,31,47,139.85	16,56,641.67
Endowment Funds	80,92,26,481.21	5,53,93,088.44
TOTAL (A)	**87,52,53,918.23**	**7,63,75,444.00**
(B) LOANS, ADVANCES AND OTHER ASSETS		
(1) Loans		
(1) Staff FA(MSc) TA(MSc) FA TA LTC Med Adv)		
Advance for expenses (Staff)	17,276.00	6,04,965.00
Advance for expenses (Research Projects) (FA-158517+TA-22196)	1,80,713.00	1,80,713.00
Land Acquisition Charges (Deposited in Hon'ble High Court)	1,80,00,000.00	1,80,00,000.00
Advance for expenses (Training Account)	-	-
Advance for IIT kanpur	12,39,000.00	12,39,000.00
Advance for Capital A/c	-	86,000.00
Advance for Vehicle Insurance	1,05,665.00	1,33,786.00
(2) Other entities engaged in activities /objectives similar to		
(3) Others (Specify)		
Adv for civil work to CPWD	1,78,30,008.00	1,78,30,008.00
Adv for civil work to CPWD- Capital Account	61,13,268.00	11,53,560.00
Loan for World Environment Day (MoEF)	2,80,984.00	2,80,984.00
Loan for WCF workshop	30,253.00	30,253.00
Loan:- D/WII A/c No. 54189	-	1,91,489.00
Loan:- D/WII A/c No. 58146	13,43,436.00	3,28,360.00
Loan:- D/WII A/c No. 01	46,625.00	-
New Salary Account	-	-
Advance payment to CCU	1,52,71,531.00	1,52,71,531.00
Advance Payment-Training Account	6,11,778.00	15,263.00
EMD Release/Received	-	-
Medical Health Insurance- Claim	-	-
(2) Advances and other amounts recoverable in cash or in kind or		
(1) On Capital Accounts		
(2) Prepayments		
(3) Others (Specify)		
Security Deposit for Electricity Connection	9,81,968.00	9,81,968.00
TDS to be refunded by the ITO (Pension Fund)	43,89,787.00	43,89,787.00
TDS to be refunded by the ITO (GPF)	22,77,757.00	22,77,757.00
TDS to be refunded by the ITO (Corpus fund)	29,07,227.00	29,07,227.00
TDS	-	-
(3) Income Accrued		-
(1) On Investments from Earmarked / Endowment Funds		-
(2) On Invesments -Others		-
Interest Accrued on FDR (GPF)	81,90,703.00	82,90,251.00
Interest Accrued on FDR (Pension Fund)	41,49,159.00	5,32,317.00
Interest Accrued on FDR (Corpus Fund)	1,37,76,578.00	1,36,76,313.00
(3) On Loans and Advances		-
(4) Others (Specify)		-
Training Cost Accrued But not Received	6,60,000.00	6,60,000.00
(4) Expenses payable towards capital/fixed Assets		-
(3) Research Project (2017-18)		-
(4) Grant in Aid (2017-18)	1,21,355.00	1,21,355.00
(5) Grant in Aid (2020-21)	1,97,400.00	23,17,127.00
TOTAL (B)	**9,87,22,471.00**	**9,15,00,014.00**
TOTAL (A+B)	**97,39,76,389.23**	**16,78,75,458.00**

FORM OF FINANCIAL STATEMENTS(NON-PROFIT ORGANISATIONS)
WILDLIFE INSTITUTE OF INDIA, CHANDRABANI, DEHRADUN
INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 2021-22

(Amt.Rs)

	Schedule	Current Year	Previous Year
INCOME			
Income from Sales/Services	12	-	-
Grants/Subsidies	13	25,14,29,587.00	21,46,22,061.00
Fees/Subscriptions	14	1,66,32,000.00	83,98,150.00
Income from Investments (from earmarked/endowment Funds Transferred to funds)	15	-	-
Income from Royalty, Publication etc	16	13,68,859.00	15,13,193.00
Interest Earned	17	3,69,551.00	4,54,664.00
Other Income	18	-	-
Increase/decrease) in stock of Finished goods and works-in-progress	19	-	-
TOTAL (A)		**26,97,99,997.00**	**22,49,88,068.00**
EXPENDITRUE			
Establishment Expenses (Plan & Non Plan)20		20,36,43,929.00	21,45,37,760.00
Other Administrative Expenses (Plan & Non Plan)	21	7,99,52,337.72	6,73,32,446.00
Expenditure on Grants, Subsidies etc.	22	-	-
Expenditure on Grants, Subsidies etc.	23	-	-
Significant account Polices (notes on Accounts)	24	-	-
CONTINGENT LIABILITIES AND NOTES ON ACCOUNTS (Illustrative)	25	-	-
Total (B)		**28,35,96,266.72**	**28,18,70,206.00**
Balance being excess of Income over Expenditure (A-B)		(1,37,96,269.72)	(5,68,82,138.00)
Prior period items (Dep. 2019-20)	-	5,38,694.00	
BALANCE BEING SURPLUS (DEFICIT) CARRIED TO CORPUS/CAPITAL FUND		(1,37,96,269.72)	(5,63,43,444.00)

FORM OF FINANCIAL STATEMENTS(NON-PROFIT ORGANISATIONS)
WILDLIFE INSTITUTE OF INDIA, CHANDRABANI, DEHRADUN
INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 2021-22

(Amt.Rs)

SCHEDULE :12 INCOME FROM SALES/SERVICES	Current Year	Previous Year
(1) Income from Sales		
(a) Sale of Finished Goods	-	-
(b) Sale of Raw Material	-	-
(c) Sale of Scraps	-	-
(2) Income from Services		
(a) Labour and Processing Charges	-	-
(b) Professional/Consultancy Services	-	-
(c) Agency Commission and Brokerage	-	-
(d) Maintenance Services (Equipment/Property)	-	-
(e) Other (Specify)-	-	
TOTAL	-	-

FORM OF FINANCIAL STATEMENTS(NON-PROFIT ORGANISATIONS)
WILDLIFE INSTITUTE OF INDIA, CHANDRABANI, DEHRADUN
INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 2021-22

(Amt.Rs)

SCHEDULE :13 GRANTS/SUBSIDIES	Current Year	Previous Year
(1) Central Government		
Grant -in- Aid from MoEF	25,51,05,000.00	22,00,00,000.00
Amount Capitalized (-)	36,75,413.00	53,77,939.00
Total	**25,14,29,587.00**	**21,46,22,061.00**
(2) State Governments (s)	-	-
(3) Government Agencies	-	-
(4) Institutions/Welfare Bodies	-	-
(5) International Organisations	-	-
(6) Others (Specify)		
WII Contribution (Pension A/c)	-	-
TOTAL	**25,14,29,587.00**	**21,46,22,061.00**

FORM OF FINANCIAL STATEMENTS(NON-PROFIT ORGANISATIONS)
WILDLIFE INSTITUTE OF INDIA, CHANDRABANI, DEHRADUN
INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 2021-22

(Amt.Rs)

SCHEDULE :14 FEES/ SUBSCRIPTIONS	Current Year	Previous Year
(1) Entrance Fees		
M.Sc.Course Fee	-	41,03,400.00
(2) Annual Fees/ Subscriptions	-	-
(3) Seminar/ Program Fees		
Seminar/ Workshop Fees	-	-
(4) Consultancy Fees		
Consultancy refund	-	-
(5) Others (Specify)		
Other Receipt (Training)	1,66,32,000.00	10,56,000.00
Receipt for Training Courses	-	-
Other Project Grant	-	32,38,750.00
Pre-receipted bill issued but not received	-	-
Receipt for Training Cost	-	-
TOTAL	**1,66,32,000.00**	**83,98,150.00**

FORM OF FINANCIAL STATEMENTS(NON-PROFIT ORGANISATIONS)
WILDLIFE INSTITUTE OF INDIA, CHANDRABANI, DEHRADUN
INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 2021-22

(Amt.Rs)

SCHEDULE :15 INCOME FROM INVESTMENTS	Investment from Earmarked fund		Investment-Other	
(income on Investment from Earmarked/Endowment funds transferred to Funds)	Current Year	Previous Year	Current Year	Previous Year
1. Interest				
(a) On Govt Securities	-	-	-	-
(b) Other Bonds/Debentures	-	-	-	-
2. Dividends:				
(a) On Shares	-	-	-	-
(b) On Mutual Fund Securities	-	-	-	-
3. Rents	-	-	-	-
4. Others (Specify)	-	-	-	-
TOTAL	-	-	-	-

FORM OF FINANCIAL STATEMENTS(NON-PROFIT ORGANISATIONS)
WILDLIFE INSTITUTE OF INDIA, CHANDRABANI, DEHRADUN
INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 2021-22

(Amt.Rs)

SCHEDULE :16 INCOME FROM ROYALTY, PUBLICATION ETC.	Current Year	Previous Year
(1) Income from Royalty		
(2) Income from Publications	-	-
(3) Others (Specify)		
Genetic lab	-	-
Misc. Receipts	15,020.00	-
UBI Building Rent	-	-
Misc Income from Lib	-	-
WII Products	-	
House Licence Fee	5,04,634.00	7,55,868.00
Bus Charges	82,541.00	27,336.00
Electricity & Water Charges	7,66,664.00	7,29,989.00
Telephone	-	-
TOTAL	13,68,859.00	15,13,193.00

FORM OF FINANCIAL STATEMENTS(NON-PROFIT ORGANISATIONS)
WILDLIFE INSTITUTE OF INDIA, CHANDRABANI, DEHRADUN
INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 2021-22

(Amt.Rs)

SCHEDULE :17 INTEREST EARNED	Current Year	Previous Year
(1) With Scheduled Banks		
Int. on Bank Deposit	-	-
Interest on FDR	-	-
Interest on Investment	-	-
(2) With Non-Scheduled Banks	-	-
(3) With Institutions	-	-
(4) Others (Specify)	-	-
Int. on Investment(Training)	-	-
Interest (Training)	3,62,770.00	4,44,664.00
Interest on HBA	6,781.00	10,000.00
(2) On Savings Account		
(1) With Scheduled Banks		
Int. on Savings Account	-	-
Accrued Interest on FDR A/c (GIA)	-	-
Interest on Saving A/c (Training A/c)	-	-
(2) With Non-Scheduled Banks	-	-
(3) Post Office Savings Account	-	-
(4) Others (Specify)	-	-
(3) On Loans		
(1) Interest on Loan & Advance	-	-
(2) Others	-	-
(4) Interest on Debtors and Other Receivables	-	-
TOTAL	3,69,551.00	4,54,664.00

FORM OF FINANCIAL STATEMENTS(NON-PROFIT ORGANISATIONS)
WILDLIFE INSTITUTE OF INDIA, CHANDRABANI, DEHRADUN
INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 2021-22

(Amt.Rs)

SCHEDULE :18 OTHER INCOME	Current Year	Previous Year
(1) Profit on Sale/Disposal of Assets		
(1) Owned Assets	-	-
(2) Assets acquired out of grants, or received free of cost	-	-
(2) Export Incentives realized	-	-
(3) Fees for Misc. Services	-	-
(4) Others (Specify)		
Misc. Receipts	-	-
EMD Forfeited	-	-
Receipt for Project	-	-
TOTAL	-	-

FORM OF FINANCIAL STATEMENTS(NON-PROFIT ORGANISATIONS)
WILDLIFE INSTITUTE OF INDIA, CHANDRABANI, DEHRADUN
INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 2021-22

(Amt.Rs)

SCHEDULE :19 INCREASE/DECREASE IN STOCK OF FINISHED GOODS	Current Year	Previous Year
(1) Closing Stock		
(1) Finished Goods		
Closing Stock of WII Publication	2,98,412.00	-
(2) Work-in-progress	-	-
(2) Less : Opening Stock		
(1) Finished Goods	2,98,412.00	-
(2) Work-in-progress	-	-
TOTAL	-	-

FORM OF FINANCIAL STATEMENTS(NON-PROFIT ORGANISATIONS)
WILDLIFE INSTITUTE OF INDIA, CHANDRABANI, DEHRADUN
INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 2021-22

(Amt. Rs.)

SCHEDULE :20 ESTABLISHMENT EXPENSES	Current Year		Previous Year	
	Plan	Non Plan	Plan	Non Plan
(1) Salaries and Wages	19,25,75,954.00	-	19,99,89,604.00	-
Salary & Wages (Training A/c)	8,42,060.00	-	5,86,413.00	-
Honorarium	1,23,500.00	-	67,000.00	-
Medical	85,90,880.00	-	83,42,536.00	-
Fellowship - Forensic Cell	-	-	-	-
Salaries & Allowances	2,40,000.00	-	7,44,000.00	-
Stipend	-	-	-	-
Fellowship & Wages (Research Project) (Gia-240915+Salary A/c -4394600)	9,09,019.00	-	46,35,515.00	-
HRA	-	-	-	-
(2) Allowances and Bonus				
Bonus	-	-	-	-
OTA	-	-	-	-
LTC	3,62,516.00	-	1,13,812.00	-
Corps Fund (Training)	-	-	-	-
Transferred to Corpus Fund	-	-	-	-
Honorarium (Training A/c)	-	-	-	-
(3) Others (Specify)				
Miscellenous Expenses	-	-	-	-
(4) Contribution to Other Fund (Specify)				
Leave Salary and Pension Contr.	-		-	-
(5) Staff Welfare Expenses				
Uniforms	-		-	-
(6) Expenses on Employees Retirement and Terminal Benefits				
Final Payment				
Leave Encashment & Gratuity	-		-	-
(7) Others (Specify)				
Camp Expenses (Research Project)	-		58,880.00	-
TOTAL	20,36,43,929.00	-	21,45,37,760.00	-

(Baljeet Kaur)
Finance Officer

(Dr. S. P. Yadav)
Director

FORM OF FINANCIAL STATEMENTS(NON-PROFIT ORGANISATIONS)
WILDLIFE INSTITUTE OF INDIA, CHANDRABANI, DEHRADUN
INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 2021-22

(Amt. Rs.)

SCHEDULE :21 OTHER ADMINISTRATIVE EXPENSES	R&P	Committed Less of Last yr committed	Current Year		Previous Year	
			Plan	Non Plan	Plan	Non Plan
AMC of Computers		-	10,21,132.00	-	24,00,589.00	-
Purchases		-		-	-	-
Annual Research Seminar		-	-	-	40,613.00	-
Contingencies/Misc. (Research Project)		-	-	-	2,78,479.00	-
Cont./Misc. (Training Account)		-	16,41,463.00	-	6,05,365.00	-
Expenses for Library		-	3,68,652.00	-	2,99,988.00	-
Electricity and Water Charges		-	92,63,821.00		99,16,134.00	-
Maint. Of WII Campus		-	7,59,190.00	-	5,33,253.00	-
Estate Security		-	3,33,51,152.00	-	63,54,384.00	-
Lab Expenses (Research lab)		-	-	-	1,66,275.00	-
Lab Expenses (Forensic Lab)		-	2,49,733.00		6,83,161.00	-
Lab Expenses (Harbarium)		-	-		-	-
Lab Expenses (Genetic Lab)		-	-		-	-
Legal Expenses		-	6,60,879.00		12,60,686.00	-
M.Sc. Course Expenditure		-	12,49,428.00		17,91,022.00	-
Operational Expenses		-	15,17,625.72		10,03,317.00	-
Corpur Fund Transfer (Training Account)			-		4,50,000.00	-
POL & Maintenance of Vehicle (Research Project)			-	-	1,02,558.00	-
POL & Maintenance of Vehicle (Training A/c)			2,52,016.00	-	1,76,600.00	-
POL for Vehicles			6,09,739.00	-	4,74,816.00	-
Postage & Telegrams			2,07,681.00	-	1,92,675.00	-
Printing & Binding			4,48,418.00	-	40,36,373.00	-
Borading & Lodging (Training Account)			30,24,610.00	-	34,64,619.00	-
Repair & Maintenance of Vehicles			2,98,756.00	-	5,23,031.00	-
Vehicle insurance			2,77,525.00	-	88,000.00	-
Repair of Vehicle (Training Account)			-	-	-	-
Repair & Maintenance furniture & Fixture			1,00,302.00	-	40,427.00	-
Sports			16,350.00	-	1,13,913.00	-
Hospitality/entertainment			2,44,759.00	-	1,24,940.00	-
Sport Goods (Training Account)			15,000.00	-	14,040.00	-
Stationery			4,54,649.00	-	9,05,818.00	-
Training Allowance			-	-	-	-
Telephone & TC			4,99,938.00	-	9,96,595.00	-
Training & Skill Upgradation of Staff			-	-	-	-
Training Cost Expenditure			-	-	-	-
Travel Exp. (Grant in Aid)			4,38,349.00	-	7,30,102.00	-
Travel Exp. (Research Project)			9,299.00	-	4,43,363.00	-
Travelling Expenses (Training A/c)			16,85,544.00	-	7,35,167.00	-
Maintinancae of civil work (Capital-234677+GIA-804060)			8,72,781.00	-	10,38,737.00	-
Computer Expenses (Consuamble)			-	-	-	-
Wild Life Health Lab			-	-	-	-
Harberium			-	-	-	-

(Amt. Rs.)

SCHEDULE :21 OTHER ADMINISTRATIVE EXPENSES	R&P	Committed Less of Last yr committed	Current Year		Previous Year	
			Plan	Non Plan	Plan	Non Plan
Complementary-Lib.			-	-	2,151.00	-
Misc. Receipta-Payment (Training Account)			-	-	11,00,000.00	-
Base Camp Expenses-Research Project		-	-	-	-	-
Antartica Programme		-	-	-	-	-
Software Renewal / Maint.		-	5,01,095.00	-	-	-
Misc. Receipt Previous Year					42,889.00	-
Opening Bal. Grant transfer for Next Financial Year 2017-18		-	-	-	-	-
Funds Transfer of Misc. Recipt to Corpus A/c			-	-	34,69,598.00	-
Depriciation during the year (22020377+506865+248415)			1,98,69,562.00	-	2,27,75,657.00	-
TOTAL		-	7,99,52,337.72	-	6,73,32,446.00	-

FORM OF FINANCIAL STATEMENTS(NON-PROFIT ORGANISATIONS)
WILDLIFE INSTITUTE OF INDIA, CHANDRABANI, DEHRADUN
INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 2021-22

(Amt. Rs.)

SCHEDULE :22 EXPENDITURE ON GRANTS, SUBSIDIES ETC.	Current Year		Previous Year	
	Plan	Non Plan	Plan	Non Plan
(a) Grants given to Institutions/Organisation	-	-	-	-
(b) Subsidies given to Institution?Organisations	-	-	-	-
TOTAL	-	-	-	-

FORM OF FINANCIAL STATEMENTS(NON-PROFIT ORGANISATIONS)
WILDLIFE INSTITUTE OF INDIA, CHANDRABANI, DEHRADUN
INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 2021-22

(Amt. Rs.)

SCHEDULE :23 - INTEREST	Current Year		Previous Year	
	Plan	Non Plan	Plan	Non Plan
(a) On Fixed Loans			-	-
(b) On other Loans (including Bank Chargs)			-	-
(c) Other (Specify)			-	-
TOTAL			-	-

FORM OF FINANCIAL STATEMENTS(NON-PROFIT ORGANISATIONS)
WILDLIFE INSTITUTE OF INDIA, CHANDRABANI, DEHRADUN
INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 2021-22

SCHEDULE – 24 SIGNIFICANT ACCOUNTING POLICES (Notes on Accounts)	
1	ACCOUNTING CONVENTION
	The financial statement are prepared on the basis of historical cost convention, unless otherwise stated and on the accrual method of accounting.
2	INVENTORY VALUATION
2.1	Stores and spares (including machinery spares) are valued at cost.
2.2	Nil
3	INVESTMENTS
3.1	Investments classified as Long term investments are carried at cost. Provision for decline, other than temporary, is made on carrying cost of such investments.
3.2	Investments classified as current are carried at lower of coast and fair value. Provision for shortfall In the value of such investments is made for each investment considered individually and not on a global basis.
3.3	Cost includes acquisition expenses like brokerage, transfer stamps.
4	EXCISE DUTY
	Nil
5	FIXED ASSETS
5.1	Fixed assets are stated at cost of acquisition inclusive of inward freight, duties and taxes and incidental and direct expenses related to acquisition. In respect of projects involving construction, related pre-operational expenses (including interest on loan for specific project prior to its completion), form part of the value of the assets.capitalized
5.2	Fixed assets received by way of non-monetary grants, (other than towards the Corpus Fund), are capitalized at values stated by corresponding credit to capital Reserve.
6	DEPRECIATION
6.1	Depreciation is provided on "Written Down Value method" as per specified in the Income-tax, 1961 except depreciation on cost adjustments arising on account of conversion of foreign currency, liabilities for acquisition of fixed assets, which is amortized over the residual life of the respective assets.
6.2	In respect of additions to/deductions from fixed assets during the year, depreciation is considered on pro-rata basis.
6.3	Nil
7	MISCELLANEOUS EXPENDITURE
	Nil
8	ACCOUNTING FOR SALES
	Nil
9	GOVERNMENT GRANT/SUBSIDIES
9.1	Government grants of the natures of contribution towards capital cost of setting up projects are treated as Capital Reserve
9.2	Government grants in respect of specific assets acquired are shown as a deduction from the cost of the releated assets.
9.3	Government grants /subsidy are accounted on realization basis.
10	FOREIGN CURRENCY TRANSACTION
10.1	Transaction denominated in foreign currency are accounted at the exchange rate prevailing at the date of the transaction.
10.2	Current assets, foreign currency loans and current liabilities are converted at the exchange rate prevailing as at the year end and the resultant gain/loss is adjustment to cost of fixed assets, if the foreign currency liability related to fixed assets, and in other cases is considered to revenue
11	LEASE
	Lease rentals are expensed with reference to lease terms.
12	RETIREMENT BENEFITS
	The pension scheme followed in the institute is based on CCS Pention Rules, for the employees appointed prior to 01 Jan 2004. The New Pension Scheme(NPS) is in operation for the employees recruited on or after 01 Jan 2004
13	PRIOR PERIOD ITEMS
13.1	Prior period items, Extra ordinary items and changes in Accounting Polices are accounted in accordance with Accounting Standard-5. Excess Deprication Charged for Rs. 538694/-during the financial year 2019-20, is now rectified as per the audit para 1.1of the Separate Audit Report as on dated 09-03-2021.

FORM OF FINANCIAL STATEMENTS(NON-PROFIT ORGANISATIONS)
WILDLIFE INSTITUTE OF INDIA, CHANDRABANI, DEHRADUN
INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 2021-22

SCHEDULE :25 - CONTINGENT LIABILITIES AND NOTES ON ACCOUNTS		Current Year		Previous Year	
		Plan	Non Plan	Plan	Non Plan
1	CONTINGENT LIABILITIES				
1.1	Claims against the Entity not acknowledged as debts	-	-	-	-
1.2	In respect of :				
	Bank guarantees given by/on behalf of the entity	-	-	-	-
	Letters of Credit opened by Bank on behalf of the Entity	-	-	-	-
	Bills discounted with banks	-	-	-	-
1.3	Disputed demands in respect of :				
	Income Tax	-	-	-	-
	Sales-Tax	-	-	-	-
	Municipal Taxes	-	-	-	-
1.4	In respect of claims from parties for non-execution of orders, but contested by the Entity	-	-	-	-
2	CAPITAL COMMITMENTS				
	Estimated value of contracts remaining to be executed on capital account and not provided for (net of advance)	-	-	-	-
3	LEASE OBLIGATIONS				
	Future obligations for rentals under finance lease arrangements for Plant and Machinery amount to	-	-	-	-
4	CURRRENT ASSESTS, LOANS AND ADVANCES				
	In the opinion of the Management, the current assets, loans and advances have a value on realization in the ordinary course of business, equal at least to the aggrerate amount shown in the Balance Sheet.	-	-	-	-
5	TAXATION				
	In view of there being no taxable income under Income-tax Act 1961, no provison for income tax has been considered necessary.	-	-	-	-
6	FOREIGN CURRENCY TRANSACTIONS				
6.1	Value of Imports calculated on C.I.F. Basis :				
	Purchase of finished Goods	-	-	-	-
	Raw Materials & Components (including in transit)	-	-	-	-
	Capital Goods	-	-	-	-
	Stores, Spares and Consumables	-	-	-	-
6.2	Expendidtudre in foreign currency:				
	a) Travel	-	-	-	-
	b) Remittances and Interest payment to Financial Institutions/Banks in Foreign Currency	-	-	-	-
	c) Other expenditure:				
	Commission on Sales	-	-	-	-
	Legal and Professional Expenses	-	-	-	-
	Miscellaneous Expenses	-	-	-	-
6.3	Earnings:				
	Value of Exports on FOB basis	-	-	-	-
6.4	Remuneration to auditors				
	As auditors				
	Taxation Matters	-	-	-	-
	For Management Services	-	-	-	-
	For certification	-	-	-	-
	other	-	-	-	-
7	Corresponding figures for the previous year have been regrouped/rearranged, wherever necessary	-	-	-	-
8	Schedules 1 to 25 are annexed to and form an integral part of the Balance Sheets as at 31 Mar 2022 and the Income and Expenditure Account for the year ended on that date.	-	-	-	-
TOTAL		-	-	-	-

GENERAL PROVIDENT FUND ACCOUNT NO. 518502010001297
WILDLIFE INSTITUTE OF INDIA, CHANDRABANI, DEHRADUNINCOME
AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 2021-22

Income		Expenditure	
Particulars	**Amount**	**Particulars**	**Amount**
Opening Balance	49,32,237.00	Final payment of GPF	1,66,07,622.00
Interest Received on Saving Account	2,63,675.00	Advance/Withdrawal paid	69,99,966.00
GPF Contribution	2,41,77,879.00		
Encashment of FDR			
Interest on FDR			
		Bank Balance	57,66,203.00
Total	**2,93,73,791.00**	**Total**	**2,93,73,791.00**

PENSION FUND ACCOUNT NO. 518502010000018
WILDLIFE INSTITUTE OF INDIA, CHANDRABANI, DEHRADUN
INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 2021-22

Income		Expenditure	
Particulars	**Amount**	**Particulars**	**Amount**
Opening Balance	1,01,09,484.00	Investment in FDR	13,50,00,000.00
Interest Received on Saving Account	6,76,450.00	Commuted Value of Pension	3,48,85,535.00
Interest Earned on FDR	57,37,251.00	Family Pension/ Pension	3,72,07,024.00
WII Contribution	70,98,930.00		
Encashment of FDR	18,96,58,656.00		
		Bank Balance	61,88,212.00
Total	**21,32,80,771.00**	**Total**	**21,32,80,771.00**

(Baljeet Kaur)
Finance Officer

(Dr. S. P. Yadav)
Director

FORM OF FINANCIAL STATEMENTS (NON-PROFIT ORGANISATIONS)
Wildlife Institute of India, Dehradun
Fixed Assets Purchased from Funds reflected in Schedule-3
ACCOUNT FOR THE YEAR ENDED 2021-22

Pariculars	Gross Block						Depreciation			Net Block	
		Addition during the year									
	Cost as at the beginning of the year			Deduction during the year	Cost as at the end of the year	As at the beginning of the year	For the year	Deduction during the year	At the end of the year	As at the current year-end	As at the Previous year-end
		Upto 30-Sep	After 30-Sep								
PLANT MACHINERY & EQPT											
BLOCK: 15%											
Office Equipment	4949817.00	1630423.00	383016.00	-	6963256.00	-	1015762.20	-	1015762.20	5947493.80	4949817.00
Camp Equipment	2127097.50	0.00	2073053.00	-	4200150.50	-	474543.60	-	474543.60	3725606.90	2127097.50
TOTAL	7076914.50	1630423.00	2456069.00	-	11163406.50	-	1490305.80	-	1490305.80	9673100.70	7076914.50
Furinitures & Fixtures											
BLOCK : 10%											
Furinitures & Fixtures	144675.34	-	-	-	144675.34	-	14467.53	-	14467.53	130207.81	144675.34
TOTAL	**144675.34**	**0.00**	**0.00**	**0.00**	**144675.34**	**0.00**	**14467.53**	**0.00**	**14467.53**	**130207.81**	**144675.34**
BOOKS : BLOCK : 40%											
Books	1602.13	-	-	-	1602.13	-	640.85	-	640.85	961.28	1602.13
TOTAL	**1602.13**	-	-	-	**1602.13**	-	**640.85**	-	**640.85**	**961.28**	**1602.13**
GRAND TOTAL	**7223191.97**	**1630423.00**	**2456069.00**	-	**11309683.97**	-	**1505414.19**	-	**1505414.19**	**9804269.78**	**7223191.97**

(Baljeet Kaur)
Finance Officer

(Dr. S. P. Yadav)
Director

भारतीय वन्यजीव संस्थान
Wildlife Institute of India

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