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34TH ANNUAL RESEARCH SEMINAR

21-22 September 2023

PROGRAMME & ABSTRACTS

भारतीय वन्यजीव संस्थान
Wildlife Institute of India

SACON

34 ANNUAL RESEARCH SEMINAR

PROGRAMME & ABSTRACTS

ARS 2023

PROGRAMME

Programme

SEMINAR CHAIRPERSON

Dr. Rajesh Gopal,
Chairman, Training Research and Academic Council

INAUGURAL SESSION

09:30 - 09:35	Welcome	**Dr. Bitapi C. Sinha** *Research Coordinator*
09:35 - 09:40	Opening Remarks	**Shri Virendra Tiwari, IFS** *Director*
09:40 - 10:00	Research activities and accomplishments	**Dr. S. Sathyakumar** *Dean*
10:00 - 10:10	Release of Publications	
10:10 - 10:20	Remarks	**Shri Bharat Jyoti, IFS** *Director IGNFA* *Guest of Honour*
10:20 - 10:30	Inaugural Address	**Dr. Rajesh Gopal** *TRAC Chairman*
10:30 - 11:15	Group Photograph and Tea	

DAY 1: 21st September 2023

Technical Session I – LEAD TALKS

Chair : **Dr. Erach Bharucha**
Co-Chair(s) : **Dr. Saket Badola & Dr. S. Sathyakumar**
Session Facilitator : **Dr. Anukul Nath**

11:15 - 11:30	Status of tigers in India	Prof. Qamar Qureshi
11:30 - 11:45	Development as conservation opportunity: Linear infra-structure through sensitive habitats	Dr. Bilal Habib
11:45 - 12:00	Milestones and miles ahead in conserving the Great Indian Bustard	Dr. Sutirtha Dutta
12:00 - 12:15	The Blind Sentinels of India's Rivers: Status of river dolphins in India	Dr. Vishnupriya K.
12:15 - 12:30	Facilitating evidence-informed decision-making to conserve India's natural heritage: The interface of economic prosperity and ecological integrity	Dr. Gopi G.V.
12:30 - 12:45	Bringing back Cheetah to India	Prof. Qamar Qureshi
12:45 - 13:00	Q & A Session, Comments by Session Chairs	
13:00 - 14:30	**Lunch and Poster Session**	

Technical Session II – Posters

Session Facilitator : Dr. Ashish Jha

S. No.	Title of Presentation	Presenter / First Author
1.	Jalmala Samvad: An Initiative towards river and its biodiversity conservation	Nidhi Singh
2.	Preliminary findings on the mammalian fauna in Kappatagudda Wildlife Sanctuary	Mohd Raza
3.	Status and distribution of Red Panda in Northeast India: A preliminary assessment	Pujan Kumar Pradhan
4.	Truncated Lives: The bleak future of elephants in Coal-Rich landscape of India	Karthy S.
5.	Agrarian Avian Assembles: Exploring the relationship between heronries and agricultural land through citizen science	Alex Jacob
6.	Nesting population assessment of three species of critically endangered *Gyps* vultures across the Indian region	Harshal Waghmare
7.	Illustrating changes in avian composition across altitudinal gradients in selected Protected Areas of Himachal Pradesh	Arnab Chattopadhyay
8.	Status and distribution of mammalian fauna in the corridors of Kaziranga-Karbi Anglong landscape, Assam, India	Mujahid Ahamad
9.	Roaring progress: A comprehensive update on strengthening tiger conservation in Nandhaur Landscape	Naveen Joshi
10.	Status of Indian Leopard (*Panthera pardus*) in Palamau Tiger Reserve, Jharkhand, India	Rohan Desai
11.	Unveiling Dugong's culinary choreography: Foraging strategies in the ever-shifting seas of the Gulf of Kachchh's (GoK) Gujarat Reef Complex	Sameeha Pathan
12.	Bridging the Gap: A railway rethink for long-term Gibbon conservation	Rohit R. S. Jha
13.	"The Tale of Toxic Trails": Tracing contamination patterns of endocrine disrupting compounds (EDCs) in habitats of threatened apex predators in the Ganga River Basin	Richika Sah
14.	Pachyderms in Plantations - Ranging patterns and habitat use of Asian Elephants (*Elephas maximus indicus*) in an agroforestry landscape of southern Karnataka	Souritra Sharma
15.	Impact of herbivory pressure Chital (*Axis axis*) on the mangroves of the Mahatma Gandhi Marine National Park, Andaman Islands	Thirumurugan V.
16.	Status of mesocarnivores with focus on clouded leopard in Buxa Tiger Reserve, West Bengal	Shekhar Sarkar

Technical Session III - CARNIVORE ECOLOGY & HERBIVORES

Chair : Dr. H. S. Negi
Co-Chair(s) : Shri S. K. Singh & Dr. K. Ramesh
Session Facilitator : Shri Varun Kher

14:30 - 14:45	Monitoring of tigers, co-predators, and prey in Vidarbha Landscape, Maharashtra.	Suman Koley
14:45 - 15:00	A decadal insight on population growth of tigers in Panna Tiger Reserve and their future	Supratim Dutta
15:00 - 15:15	Interaction patterns among predator guild of trans-Himalayas: What structures a carnivore community in dynamic anthropogenic landscapes?	Priyanka Justa
15:15 - 15:30	Demography of chital in moist deciduous forest of central India	Shravana Goswami
15:30 - 15:45	"The Gully Boy of Junnar": Ecology of leopards in human-dominated landscape of western Maharashtra	Kumar Ankit
15:45 - 16:00	Mishmi Takin: Insights of a rare and least known bovid from Arunachal Pradesh	Gaurav P J
16:00 - 16:15	Restoring the Wild: Gaur's resilient return to Bandhavgarh Tiger Reserve	Ritesh Vishwakarma
16:15 - 16:30	Q & A Session, Comments by Session Chairs	
16:30 - 17:00	**Tea Break**	

Technical Session IV - AVIAN ECOLOGY

Chair : Shri Arindam Tomar
Co-Chair(s) : Dr. Gaurav Sharma & Dr. R Suresh Kumar
Session Facilitator : Shri Ritesh Gautam

17:00 - 17:15	Tracking the Rain-bird: Satellite telemetry of Pied cuckoo (*Clamator jacobinus*) to understand it's migration pattern	Debanjan Sarkar
17:15 - 17:30	Ranging pattern through GPS-tracking of resident and migratory vultures of Panna Tiger Reserve, Madhya Pradesh	Dibyendu Biswas
17:30 - 17:45	Bird hazards to aircraft in Indian Air fields	Dr. Pramod P.
17:45 - 18:00	Ecological impacts of poultry waste on urban raptors: Conflicts, diseases, and climate change implications amidst pandemic threats	Dr. Nishant Kumar
18:00 - 18:15	Q &A Session, Comments by Session Chairs	
19:30 - 20:30	**Cultural program**	
20:30	**Dinner (All invited)**	

Day 2: 22nd September 2023

Technical Session V - SPEED TALKS

Chair : Dr. V. B. Mathur
Co-Chair(s) : Sh. S. K. Awasthi & Dr. Parag Nigam
Session Facilitator : Dr. Ashish Jha

09:00 - 10:30 Speed Talks (5 Minutes Each)

1.	Underwater soundscape: Acoustic response of Ganges River Dolphin in noisy environment	Gargi Roy Chowdhury
2.	Can data-driven machine learning approach aggrandize the connectivity analysis: An avenue to tiger connectivity in Eastern Vidarbha Landscape	Akshayi A. S
3.	Density estimation of ungulates using a robust method of population estimation in a semi-evergreen tropical rain-forest of North-East India	Surojit Moitra
4.	Integrative taxonomic approach in delineating cryptic herpeto-fauna diversity of Northeast India	Bitupan Bouruah
5.	Assessing dolphin oil bait fishing in Assam: A scientific inquiry	Dr. Sunny Deori
6.	The Simian amidst Sapiens: Ranging patterns and movement strategy of the synanthropic Rhesus macaque (*Macaca mulatta*) in a mosaic landscape in northern India	Uddalak Bindhani
7.	eDNA as a biodiversity monitoring tool	Bhawana Pant
8.	From Pixels to Conservation: Automating dugong and other marine mega-fauna detection through artificial intelligence (AI) and machine learning	Sagar Rajpukar
9.	Occupancy and nest site selection of endangered Nilgiri Laughingthrush *Montecincla cachinnans* in the southern Western Ghats	Sujin N. S.
10.	Spatiotemporal habitat ecology of smooth-coated otter in the Bhavani-Noyyal River basin, Tamil Nadu.	Ankit Moun
11.	Unveiling the effects of elevation and disturbance through intermediate disturbance hypothesis: A case study of vegetation patterns from Churdhar Wildlife Sanctuary, Himachal Pradesh	Priyanka Sharma
10:15 - 10:30	Q & A Session, Comments by Session Chairs	
10:30 - 11:30	**Poster Session & Tea**	

Technical Session VI – Posters

Session Facilitator: Dr. Anukul Nath

S. No.	Title of Presentation	Presenter / First Author
1.	Critically endangered river Terrapin *Batagur baska*	Amritha Balan
2.	A life less ordinary: Ganga Praharis Initiative	Amanat Gill
3.	Establishment of community resilience resource centre	Vinod Joshi
4.	Gender Advancement for Transforming Institutions (GATI)	Deepika Dogra
5.	Monitoring the vulnerability of mangrove vegetation and carbon stocks to sea level change in Andaman Islands	Shamna K.T.
6.	Utilising multi-platform remote sensing for canopy height estimation: Implications for carbon sequestration analysis	Kamna Pokhariya
7.	Bal Ganga Praharis: Tiny hands for nature conservation	Aarti Chauhan
8.	Floristic diversity, vegetation types and status of soil nutrients in Ladakh, Indian Trans Himalaya	Bushra Aimon
9.	A web-based decision support system (WEB-DSS) for visualizing, strategizing and formulating policies for climate change adaptation in the Indian Himalayan region	Ankit Singh
10.	Ecosystems in turmoil: A case study of disaster risk assessment at a pilot site of Kailash Sacred Landscape	Debaleena Chatterjee
11.	Navigating Valleys: A proposal to integrate lepidopteran ecology in Himalayan climate assessment	Irina Das Sarkar
12.	Coastal uplift and subsidence shape mangrove-associated brachyuran crab community across the Andaman Islands	Mayur Fulmali
13.	Nesting population assessment of sea turtles along the west coast of India	Parvathi Nambiar
14.	Monitoring the effectiveness of capacity building of stake-holders in Ganga River Basin	Sana Shaikh
15.	Unveiling the Green Invaders: Mapping dominant invasive plants in wet grasslands of Kaziranga Tiger Reserve, Assam	Umar Saeed

Technical Session VII - AQUATIC ECOLOGY

Chair : Shri S. S. Rasaily
Co-Chair(s) : Dr. K. Sivakumar & Dr. J. A. Johnson
Session Facilitator : Ms. Chinmaya Ghanekar

11:30 - 11:45	Dugong conservation in India: A review of progress and a glimpse forward	Swapnali Gole
11:45 - 12:00	Planning and management for aquatic species conservation and maintenance of ecosystem services in the Ganga River Basin for a clean Ganga – Learning and achievements	Dr. Shivani Barthwal
12:00 - 12:15	"A sound solution: Pingers to reduce the mortality of river dolphins"	Merin Jacob
12:15 - 12:30	An insight into ecological status of select Indian Rivers	Dr. Tanveer Ahmed
12:30 - 12:45	Where do solitary nesting Olive Ridley turtles go? Tracking the migratory journeys of turtles from the Maharashtra coast	Mohit M.
12:45 - 13:00	Q & A Session, Comments by Session Chairs	
13:00 - 14:00	**Lunch**	

Technical Session VIII - MIXED BAG

Chair : Shri V. K. Uniyal
Co-Chair(s) : Dr. Krishnendu Mondal & Dr. Gopi G. V.
Session Facilitator : Shri Prashant Mahajan

14:00 - 14:15	Diverse, disguised, and delicate: Exploring herpetofaunal diversity in Arunachal Pradesh, India	Naitik Patel
14:15 - 14:30	Conservation Action Plan for Manipur's Brow-antlered deer or Sangai: An integrated approach.	Mirza Ghazanfarullah Ghazi
14:30 - 14:45	Chasing the unicornis: Evolutionary history, genetic health and their conservation	Shrewshree Kumar
14:45 - 15:00	Genomic studies on Rusty-spotted cat	Dr. Shomita Mukherjee
15:00 - 15:15	Landscape and patch attributes impacting the patterns of mammalian assemblages in the fragmented landscape of Ballari district, Karnataka	Asit Kumar
15:15 - 15:30	Present imperfect, future precipitous? Wildlife assemblages and impacts due to an upcoming railway infrastructure in a dry deciduous forest-scape of Jharkhand	Rohit R. S. Jha
15:30 - 15:45	Assessment and monitoring of climate change effects on wildlife species and ecosystems for developing adaptation strategies in the Indian Himalayan Region: Bridging NMSHE-Phase I and II	Dr. Vineet Dubey
15:45 - 16:00	A safe place to cross the road: Use of crossing structures by wildlife in a tiger landscape and implications for multi-species road impact mitigation	Akanksha Saxena
16:00 - 16:15	Coherence of local institutions in securing people-park interface around Kaziranga Tiger Reserve, Assam	Manisha Ashraf

16:15 - 16:30	Mangrove vegetation response to the coastal uplift and subsidence caused by 2004 Tsunami in the archipelago of Andaman and Nicobar, India	Anoop Raj Singh
16:30 - 16:45	Q & A Session, Comments by Session Chairs	
16:45 - 17:30	**Tea Break**	

CONCLUDING SESSION

Chair : Dr. Rajesh Gopal, Chairman, TRAC
Co-Chair : Sh. Virendra R Tiwari, Director, WII
Session Facilitator : Dr. Bitapi C Sinha

17:30 - 18:00	Comments on the Annual Research Seminar	
18:00 - 18:10	Comments by Director WII	**Shri Virendra Tiwari, IFS** *Director*
18:10 - 18:30	Photographic Competition Awards	**Dr. Bitapi C. Sinha** *Research Coordinator*
18:30 - 18:45	IARS & ARS Best Presentation/Poster/Speed talk Awards	**Dr. Bitapi C. Sinha** *Research Coordinator*
18:45 - 19:00	Concluding remarks	**Dr. Rajesh Gopal** *Chairman, TRAC*
19:00 - 19:15	Vote of Thanks	**Dr. Bivash Pandav** *Associate Research Coordinator*

Day 3: 23rd September 2023

10:00 - 13:00	**Training, Research and Academic Council (TRAC) Meeting** ***(For members only)***

ABSTRACTS

Project Title:
All India monitoring of tigers, co-predators, prey and their habitat in India 2022

Principal Investigator(s):
Qamar Qureshi,
Dr.Y.V. Jhala,
Dr.Vishnupriya Kolipakam,
Dr. S.P.Yadav,
Dr.Amit Mallick
Dr. Rajendra Garawad

Researcher(s):
Dr. Swati Saini, Ujjawal Kumar, Shikha Bisht, Ayan Sadhu, Debranjan Laha NTCA-WII Tiger Cell, A team of Researchers & Forest Staffs

Funding Agency:
National Tiger Conservation Authority

Project Duration:
2021-2022

Keywords:
Tiger population, MSTrIPES, Invasive plants, Restoration

Twitter Handles:
@ntca_india, @MSTrIPES, @SPYadavIFS

Tweet:
🐯🌿 Exciting News for India's Tigers! IN🐯
Preserving our heritage and achieving sustainable development can be measured by the thriving tiger population. India's tiger population stands at 3682 (range 3167 to 3925), with a 6% annual increase since 2006.

Status of tigers in India (2022)

Qamar Qureshi

Aim:
Preserving our natural heritage and achieving sustainable development can be measured by the thriving tiger population. This monitoring exercise is to assess the status and develop appropriate strategies for biodiversity conservation in areas suitable for tigers.

Methods:
The tiger estimation effort spanned across 3.8 lakh km^2 of forests in 19 states, including a 6,41,449 km survey with 32,803 camera trap locations yielding 4,70,81,881 photos, including 97,399 of tigers. Over 3080 individual tigers (> 1 year) were uniquely identified. Data collection was facilitated by an MSTrIPES, android application. AI based tool CaTRAT was used for species segregation and Extract Compare was used for individual identification of tigers. Spatial data with tiger capture histories, prey, habitat, and disturbance indices were used in a spatially explicit capture-mark-recapture framework to estimate tiger populations. Based on habitat assessment since 2006, till 2022, we analyzed invasive plant spread, rates, and drivers. We prioritised sites for invasive species management.

Results:
The 2022 assessment estimated 3,682 tigers (3,167 to 3,925 individuals). Notably, 83% of these tigers were captured on camera traps, while 87% were accounted for through capture-mark-recapture methods. The tiger populations have been growing at an annual rate of 6% since 2006. The habitat assessment indicates a pressing concern invasive plant species now threaten 66% of Indian biomes and are expanding at a rate of 700 km^2 per year. Our analysis highlights the importance of prioritizing restoration efforts in areas that have experienced less invasion (approximately 122,000 km^2) to maximize biodiversity benefits.

Conclusion:
Tiger recovery in India resulted from securing habitats through strict protection and voluntary village relocation from tiger reserves. The tiger population has recorded growth in the states of Madhya Pradesh, Uttarakhand, and Maharashtra and decline in Chhattisgarh, Jharkhand, Odisha, Mizoram, Goa, and Arunachal Pradesh. The decline is associated with poor habitat and prey loss. Recognizing the threat posed by invasive plant species is crucial for future conservation policies, and our findings offer valuable insights for devising strategies to combat this ecological challenge. Preserving India's natural heritage, as exemplified by its thriving tiger population, remains a pivotal element in achieving sustainable development.

Development as conservation opportunity: Linear infrastructure through sensitive habitats

Dr. Bilal Habib

The debate over development as a conservation opportunity centres on finding ways to balance economic growth and environmental protection. Some argue that sustainable development can create opportunities for conserving natural resources and biodiversity. Striking a balance between development and conservation remains a complex and ongoing challenge.

The globe today is divided into the developed and developing world. Developing nations have already achieved the pinnacle of human, social and economic development, albeit with great ecological costs that are being faced by the whole world. This fast-paced development in the past century has also decimated biodiversity in the global west.

Consequently, most of the world's biodiversity is found in the developing and under-developed nations. About 10% of the Earth's surface houses 70% of the planet's terrestrial biodiversity, and most of these occur in 'mega-diverse' nations in the developing regions. These are also the regions with high human population densities and developmental aspirations, where currently, 83% of the world's population lives. The governments in these regions accord the highest priority to development of transportation infrastructure, which would have a direct bearing on economic and social growth. These regions also have the most to lose in terms of biodiversity and forest cover, and the collapse of ecosystem services, affecting forest-dependent communities heavily. The anticipated costs of such development and the desire to conserve the last remaining biodiverse regions of the world often lead to 'conservation and development' conundrum, and the question of whether there exists a way to forge an alliance between both. More importantly, can this development be used as an opportunity for conservation?

In this talk, I would be elucidating the ways in which development can be a tool to aid conservation. I would do so using the example of linear infrastructure development in India, particularly roads and railway lines, through critical wildlife habitats. Using case studies, I would be exploring the intricacies of the ways in which biodiversity conservation concerns can be integrated into development plans.

Project Title:
Development as conservation opportunity: Linear infrastructure through sensitive habitats

Principal Investigator(s):
Dr. Bilal Habib

Researcher(s):
Akanksha Saxena (Project Scientist)
Dr. Amit Kumar (Project Scientist)
Dr. Indranil Mondal (Project Scientist)
Shaheer Khan (Senior Project Associate)
Dr. Shivam Shrotriya (Project Scientist)
Dr. Sudip Banerjee (Principal Project Associate)
Zehidul Hussain (Principal Project Associate)

Funding Agency:
NTCA, MFD, MSRDC, NHAI, MoR

Project Duration:
2017 - ongoing

Keywords:
Mitigation, case-studies, sustainable developemnet

Twitter Handles:
@moefcc, @wii_india, @wildwithwolves, @bhlab_india

Tweet:
Can we shape development to benefit conservation? @wildwithwolves delved into the complex crossroads of development vs. conservation & explored the intricacies of such opportunities.

Project Title:
Habitat improvement and conservation breeding of Great Indian Bustard

Principal Investigator(s):
Dr. Sutirtha Dutta,
Dr.V. Kolipakam, Dr. L. Kawlni,
Q. Qureshi,
CWLW Rajasthan &
DFO Jaisalmer,
Partner agencies - MoEFCC,
Rajasthan Forest Department,
International Fund for Houbara Conservation

Researcher(s):
Tushna Karkaria, Vipul Bishnoi,
Bipin C. M., Pravesh Sakhlani,
Mohib Uddin, Sourav Supakar,
Tanya Gupta, Hrishika Sharma,
Hemlata Joshi, Indranil Paul,
Anjali Nagar, Anshuman Pati,
Shimontika Gupta, Nikhila Purohit,
Swapna Lawrence,
Sweta Bhattacharya,
Mahesh Gujjar, Mayuri Moitra,
Binya Sagar

Funding Agency:
National CAMPA Authority

Project Duration:
2016-24

Keywords:
NA

Twitter Handles:
@moefcc, @wii_india, @moefcc,
@wii_india, @ForestRajasthan
@HoubaraFund, @vrtiwari1
@SutirthaDutta82

Tweet:
NA

Milestones reached and miles ahead in conserving the Great Indian Bustard

Dr. Sutirtha Dutta

Species such as the Great Indian Bustard (GIB) are inevitably periled due to the intersection of slow life-history traits, dependence on large landscapes, and multiple threats in habitats spread across the historically marginalized "Open Natural Ecosystems." Their populations are on steady decline for at least five decades. To prevent imminent extinction and allow future rewilding in restored habitats, a conservation breeding program was commenced in 2019, after prolonged consultation and advocacy. Here, we review the progress of the first phase of this initiative and propose a scientifically informed plan to safeguard the species' future. Under the Bustard Recovery Program, conservation breeding centers have been established in Jaisalmer, Rajasthan. The program is establishing a founder population of captive GIB by searching nests, collecting wild-laid eggs, hatching them artificially, hand-rearing chicks, and developing a de novo scientific husbandry and veterinary approach to rear these sensitive birds in captivity. While birds have commenced natural breeding, efforts towards assisted reproduction to scale up captive reproductive output is underway. The program has secured a captive population of 29 individuals (18 females and 11 males) from 38 eggs collected between 2019-23. Captive breeding has commenced since March 2023. The impact of founder establishment on the wild population is expectedly negligible as tagged females were found to relay eggs after collection, to the tune of ~4 eggs in a breeding season. The program has converted ~60% of collected eggs into adults, against an optimistic expectation of 50% founder recruitment rate based on the best-performing international bustard conservation breeding programs. Whilst in the wild, recruitment rate is ~20% based on ongoing monitoring of stage-wise survival rate, to inform in-situ management. Although the initial success in securing founder population and commencing captive breeding have raised hope for the species' recovery, the ultimate success of this challenging initiative will depend on training of birds for release and their successful re-establishment across the native range. This entails securing critical GIB conservation areas across range states and their restoration through concerted actions by multiple agencies that are guided by sound science.

The Blind Sentinels of India's Rivers: Status of river dolphins in India

Dr. Vishnupriya Kolipakam

Aim:
Monitoring populations is an important aspect of conservation decision-making. Despite being an indicator species for one of the most stressed habitats in the world, our knowledge on the status of river dolphins is significantly limited. This is exacerbated by the ecology of the species, wherein their average surfacing time is less than 2 seconds, making it extremely difficult to spot and monitor them.

Location:
Ganga, Brahmaputra and Beas river systems.

Methods:
Through an extensive decade-long research endeavour, we have devised a methodology to quantify dolphin populations, using underwater acoustic hydrophones. As part of 'Project Dolphin', carrying out the longest freshwater survey spanning ~9000 kms, we have ascertained crucial habitats that are vital to their survival, and threats that endanger their survival. To counter these threats, we have developed, tested and used new technology like acoustic deterrents to reduce bycatch. During the course of this research, we have also used technology like eDNA to understand the current status of biodiversity in the rivers.

Results:
Through this survey we have identified areas that are of critical importance to dolphins and need to be conserved for securing the future of dolphins. Additionally, we have identified parameters that govern the well-being of this species. Protection, water depth, and river morphology play a crucial role in the distribution of dolphins, as they govern the presence and quality of microhabitats important for other biodiversity like fish and planktons. We also discuss the optimal depth required for dolphins, as this has consequences for developmental activities like mining and water abstraction.

Conclusion:
Dolphins serve as indicator species and apex predators, underscoring the significance of their conservation in ensuring a healthy ecosystem. Additionally, it is the most marginal of communities who depend on the river for their lives and livelihoods, securing the future of dolphins and aquatic ecosystems also fosters the overall well being of all life forms. Through this project, we are able to find areas which are important in terms of abundance, neonate survivorship as well as mounting threats. These inputs will be critical for managing the future of our aquatic habitats.

Project Title:
Rangewide estimation of River Dolphins

Principal Investigator(s):
Dr. Vishnupriya Kolipakam
Qamar Qureshi

Researcher(s):
A team of 33 Researchers

Funding Agency:
CAMPA MoEFCC

Project Duration:
2021-2025

Keywords:
NA

Twitter Handles:
@moefcc, @wii_india, @V_Kolipakam, @wii_india, @vrtiwari1, @bivashranjan2, @moefcc

Tweet:
Intensive monitoring of the blind sentinels of India's rivers gives insights into one of the most fascinating animals. Science informs conservation on ecological requirement of river dolphins

Project Title:
Wildlife Institute of India's Environment Impact Assessment Cell Activities

Principal Investigator(s):
Dr.Gopi G.V., Dr. Abhijit Das, Dr. Malvika Onial

Researcher(s):
Rohit R.S. Jha (Senior Project Associate), Frank SJD (Project Scientist), Dipak Anand (Senior Project Associate) Sumit K Arya, (Project Associate II), Priyanka Das (Senior Project Associate), Stanzin Zangmo (Associate), Alex Jacob (Research Intern), Avinash Yadav (JRF), Aruna K Rath (Project Associate I), N. Abhin (Project Associate I), Ajit Sahu (Project Associate I), Nonita Rana (Research Intern)

Funding Agency:
Various Agencies

Project Duration:
3 years
(October 2020 to ongoing)

Keywords:
Conservation Advisory, Decision Support, SC-NBWL, Statutory bodies, Development.

Twitter Handles:
@gopigv, @rrs_jha

Tweet:
India's on a fast track to progress with booming #linearinfrastructure and other #developmentalprojects. @gopigv emphasized myriad ecological assessments carried out by #WIIEIACell that facilitates evidence-informed conservation decision-making

Facilitating evidence-informed decision-making to conserve India's natural heritage: at the interface of economic prosperity and ecological integrity

Dr. Govindan Veeraswami Gopi

Aim:
Wildlife Institute of India in its pursuit to strengthen conservation efforts is being increasingly faced with challenges and complexities for wildlife conservation in face of rapid economic development. Reconciling development needs with conservation priorities is complex and the "Environment Impact Assessment Cell" at WII offers critical decision support to several statutory bodies through science based evidence.

Location:
15 states viz., Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Chhattisgarh, Himachal Pradesh, Jharkhand, Karnataka, Madhya Pradesh, Meghalaya, Odisha, Rajasthan, Sikkim, Uttarakhand, Uttar Pradesh, covering 9 out of 10 biogeographic zones in India.

Methodology:
The cell's database was analysed for (i) to whom the decision support is being provided, (ii) spatial and temporal scale of such assessments, (iii) sector wise advisory provided, (iv) revenue generated and (v) scientific outputs

Results and discussion:
The Cell carried out 53 myriad ecological assessments on a range of linear infrastructure and mining projects since October 2020. These were carried out for advisory support to various apex level committees/courts including the EAC (2), FAC (24), SC-NBWL (15), Ministry of Power (1), State Forest Departments (2), NFR (1), NHAI (1), NTCA (1), IRO (1), NHPC (1), NTPC (1), Hon'ble NGT, (1) Hon'ble Supreme Court's CEC (2). Linear infrastructure (Road 16 and Rail 7) topped the type of projects appraised by the Cell, followed by mining (11), power (5). Appraisals included powerlines, extended reach drilling, river bed material extraction, and numerous tasks related to evaluation of appropriateness and adequacy of mitigation measures. As part of the assessments, we carried out 15 short-term, 10 long-term, 26 site inspection visits and 2 Comprehensive Impact Assessment. The cell received funds of Rs. 6,86,77,325 since October 2020.
I discuss in this talk, with several case studies about the commonalities, complexities, gaps, way forward and the need for science-based informed decision-making for conservation to synergise economic prosperity and ecological integrity.

Bringing back Cheetah to India

Qamar Qureshi

Aim:

Project Cheetah represents an endeavour aimed at rejuvenating India's lost natural treasures and preserving its arid grasslands and savannah ecosystems. This initiative is a crucial step toward reviving the country's biodiversity.

Method:

In a historic event cheetahs made their return to India seven decades after their local extinction. On September 17, 2022, the Honourable Prime Minister of India released cheetahs into Kuno National Park. This achievement followed two years of inter-governmental meetings, discussions, negotiations, and agreements.

A total of twenty cheetahs were translocated from Namibia and South Africa in two phases, each group undergoing mandatory quarantine. In September 2022, eight cheetahs arrived from Namibia, followed by an additional twelve from South Africa in February 2023. These cheetahs were carefully prepared for intercontinental travel and equipped with radio collars to facilitate monitoring.

Results:

To determine suitable habitat, the project employed maximum entropy models, utilizing cheetah presence data from Southern Africa (including South Africa, Namibia, Botswana, and Zimbabwe) and relevant eco-climatic variables. Several potential sites were evaluated, with Kuno National Park emerging as the most suitable. Upon arrival, the cheetahs were initially housed in quarantine bomas for disease evaluation. Following assessment, they were transferred to acclimatization bomas, ranging from 50 to 150 hectares in size, where they preyed upon the local fauna. After an acclimatisation period, fourteen cheetahs were released into the wild. Their daily ranging patterns averaged 4.28 km (SE 0.78 km). However, three cheetahs succumbed to infections, prompting their recapture and subsequent treatment. Additionally, one female successfully gave birth to four cubs in the boma, with one cub surviving. As of now, fourteen adult cheetahs are surviving in Kuno National Park. Currently, all are in stable condition, along with a female cub.

Conclusion:

The introduced cheetah population is demonstrating promising progress in their new habitat. Plans are underway to release them back into the wild and make preparations for introducing more cheetahs, thus establishing a viable metapopulation in India. This milestone achievement marks a significant stride toward conserving India's biodiversity and ensuring the presence of the cheetah in the country's ecosystems.

Project Title:
Cheetah introduction in India

Principal Investigator(s):
Dr. S.P Yadav, Qamar Qureshi, Dr. Y.V. Jhala, Dr. Amit Mallick, Dr. Rajendra Garawad

Researcher(s):
Mr. Bipin C.M, Mr. Keshab Gogoi, Mr. Harshvardhan Singh Rathore, Mr. Sultan, Mr. Moulik Sarkar, Ms. Parul Sen, Ms. Nupur Rautela, Ms. Kesha Patel, Dr. Sumit Kumar Patel, Mr. Kathan Bandopadhyay, Mr. Akshay Jain, Mr. Amandeep Rathi, Ms. Serene Edwina Rynjah, Mr. Geet Kale, Mr. Himanshu Sahu

Funding Agency:
MoEFCC-CAMPA, NTCA & Indian Oil

Project Duration:
2020-ongoing

Key words:
Kuno National Park, South Africa, Namibia, Prey preference, Ranging

Twitter Handles:
@moefcc, @wii_india, @wii_india, @ntca_india, @spyadavifs, @vrtiwari1

Tweet:
Update on Project Cheetah: Reviving India's Lost Treasures. Daily ranges: 4.28 km (SE 0.78 km) - Cheetahs acing adaptation in their new home! Exciting plans ahead: Releasing them into the wild, growing India's cheetah family

Project Title:
Planning and management for aquatic species conservation & maintenance of ecosystem services in the Ganga River basin for a clean Ganga

Principal Investigator(s):
Dr. Bitapi C. Sinha

Researcher(s):
Ms. Nidhi Singh (Project Fellow),
Ms. Tanvi Gaur (Project Fellow),
Mr. Abhishek Kumar (Project Fellow),
Mr. Shree Pal (Project Fellow),
Mr. Niraj Aswal (Project Assistant),
Ms. Sonu (Project Assistant),
Mr. Vineet Rawat (Project Assistant),
Mr. Anuj Kushwaha (Project Assistant),
Ms. Kashish Sherdia (Project Assistant).

Funding Agency:
NMCG

Project Duration:
2019-2025

Key Words:
Awareness, Conservation Education, Knowledge retention, Nature Interpretation

Twitter Handles:
@moefcc, @wii_india, @moefcc, @MoJSDoWRRDGR @wii_india, @cleanganganmcg, @DarpanGanga, @BitapiSinha, @badola_ruchi, @SyedAinulHussa2, @asokji, @RajivRanjanMis5

Tweet:
Jalmala Samvaad is a conservation education initiative. The activities in the workshops were game-based to make learning recreational. It focuses on the river basin and how students and teachers can contribute towards the conservation initiatives.
#conservation #sundarbans #estuarineturtle

Jalmala Samvaad: An initiative towards river and its biodiversity conservation

Nidhi Singh, Tanvi Gaur, Abhishek Kumar and Sonu

Aim:

To disseminate information about the river and its biodiversity to school students and help them become intelligent, take informed decisions about how they can contribute to river conservation

Location:

River Yamuna is the right bank tributary of the river Ganga, while rivers Gomti and Gandak are the left bank tributaries of the river Ganga. Awareness programs were conducted in schools along the three rivers in 23 districts of 4 states, namely Uttarakhand, Haryana, Uttar Pradesh and Bihar.

Methods:

Interactive sessions, audio-visual presentations, games, quizzes, & questionnaires, hands-on activities and the establishment of "Nature Interpretation" corners called the Jalmala Samvaad were conducted. 4452 students from 90 schools were targeted for the awareness programmes. Before the start of the programme, students were given a questionnaire to find out their knowledge about the subject. After a time span of 2-3 months students who undertook the pre-survey were again targeted for the post survey.

Results:

In this poster, we are depicting the results from 27 schools along Yamuna river. So far, we have conducted pre and post-questionnaire surveys with 1303 respondents and targeted students of the age group 13 to 18 years. Comparing the responses, we found a 20 % increase in their knowledge about biodiversity, 13% growth in cultural & heritage values of the river and a 24% increase in Attitude based questions and a 8.4% increase in Conservation Value based questions.
The Wilcoxon Signed Rank test on paired samples revealed that the difference observed between pre and post-questionnaires were statistically significant ($p = <0.05$). The analysis shows 22.80% increase in knowledge retention among individuals aged 13 to 15, and a substantial 17.30% for the 16 to 18 age group.

Conclusion:

Our study shows that the combined approach of game based conservation awareness workshop and establishment of interpretive corners helps in knowledge retention and will go a long way in helping the students. The study reinforced the importance of non formal learning.

Preliminary findings on the mammalian fauna in Kappatagudda Wildlife Sanctuary

Mohd Raza

Aim:
To assess the diversity and abundance of mammalian fauna in Kappatagudda Wildlife Sanctuary using line transect, sign survey and camera trap methods.

Location:
The study was carried out in Kappatagudda Wildlife Sanctuary situated in the Gadag district of Karnataka state which comes under the semi-arid zone.

Methods:
The line transect, sign survey and camera trap methods were used to collect data from 2 May to 2 June 2023. Around 23 line transect were laid in the study area and each transect replicated five times for data collection. A total of 69 trails, covering 23 beats of Kappatagudda wildlife sanctuary, were walked for collecting sign survey data. Through line transect and sign surveys active animal trails and vantage locations were identified. Around 48 camera traps were deployed in the area based on the line transect and sign surveys. Camera traps were set to operate 24 hours per day and programmed to take sequential photographs.

Result:
The overall result showed the presence of 19 mammalian species in the Kappatagudda wildlife sanctuary. Around 7 mammalian species were sighted through direct sighting, 14 mammalian species showed signs through sign surveys and 19 mammalian species were recorded through camera trap in Kappatagudda WLS. Out of 19 species, six were carnivores, seven were herbivore, and seven were omnivores. Among these mammals, jackals displayed the highest average encounter rate (n=96) and average relative abundance index (n=98). The lowest values of average encounter rate was shown by leopard (n=6) and lowest relative abundance was shown by Rusty spotted cat (n=3). Around 8% were diurnal, 50% were nocturnal, 33% were cathemeral, and 8% were crepuscular in nature. The correlation between encounter rates and relative abundance was conducted, which indicated a moderate positive correlation between these two variables. This signifies that as the encounter rate increases, the relative abundance also moderately increases.

Project Title:
Study on the status, habitat and conservation of Indian grey wolves and associated carnivores at Kappatagudda WLS and other forest in Gadag Division

Principal Investigator(s):
Dr. Salvador Lyngdoh

Researcher(s):
Mohd Raza (Project Associate I)

Funding Agency:
Karnataka Forest Department

Project Duration:
2023-2024

Keywords:
NA

Twitter Handles:
@moefcc, @wii_india

Tweet:
NA

Project Title:
Pan India assessment and monitoring of endangered species under IDWH - Red Panda

Principal Investigator(s):
Dr. Gopi G.V
Dr. Bilal Habib

Researcher(s):
Tamali Mondal
(Senior Project Associate:)
Pujan Kumar Pradhan
(Project Associates–I)
Pooja Kumari
(Project Associates–I),
Roshme Borgohain
(Project Associates–I)

Funding Agency:
Ministry of Environment, Forest and Climate Change (MoEF&CC)

Project Duration:
24 months
(Dec 2022 to Dec 2024)

Keywords:
Ailurus fulgens, Endangered Species, Eastern Himalaya, Camera Trapping, Conservation

Twitter Handles:
@moefcc, @wii_india, @gopigv, @wildwithwolves, @forestandocean6, @thepkpradhan, @RoshmeBorgohain, @PoojaKumari_wii

Tweet:
@thepkpradhan, @PoojaKumari_wii presented on "Status and Distribution of Red Panda in Northeast India: A Preliminary Assessment" highlighting the current status and way forward for Red Panda conservation. #IDWH #RedPanda #Conservation #NEIndia

Status and distribution of Red Panda in northeast India: A Preliminary Assessment

Pujan Kumar Pradhan and Pooja Kumari

Aim:
Red panda (*Ailurus fulgens*) is one of the most elusive and endangered species, which is rapidly losing its habitat across the distribution range primarily due to anthropogenic pressures. Considering the lack of ecological information on this species, this study aims to establish ecological baselines on this species.

Location:
North Bengal, Sikkim and Arunachal Pradesh.

Methods:
The associated habitats of red panda viz., oak mixed, mixed-broad leaf conifer and conifer with dense bamboo-thicket understorey were selected for the study. 4x4 km^2 grids were established for sampling and key informant surveys in villages within a 2 km radius of these habitats were conducted. Sign surveys and camera trapping were used to detect the presence and abundance of Red Panda.
Vegetation assessments were conducted near camera trap locations. The data were analysed using MS Excel, R and ArcGIS was used for mapping.

Results:
951 key informants were interviewed in 101 villages and 109 camera traps were deployed. 34 indirect signs and 2 direct sightings of Red Panda were observed.
In Anjaw district, Arunachal Pradesh, most key informants (31.2%) belonged to the 30-40 age group. Over the past decade, 60% of respondents reported encountering red pandas, with 51.5% of these sightings being direct, including in the wild, dead carcasses, and trapped individuals. 27 camera traps for 1035 camera trap days captured 435 independent species encounters. Mishmi Takin, with high abundance while the Red Panda was the least frequently observed. First-ever photographic record of Red Panda in Anjaw was obtained during the survey.

Discussion and conclusion:
The work is the result of five months' field survey carried between March and July, 2023. While we have recorded numerous mammalian species using camera traps, the detection of red pandas has been challenging. Further surveys will be carried out to provide insights on red panda ecology and conservation scenario, assessing habitat suitability, identify, predict potential habitats and predicting impact of climate change on species range in addition to developing a monitoring protocol for this species.

Truncated Lives: The bleak future of elephants in a Coal-rich landscape of India

Karthy S

Aim:
To understand the effect of an upcoming coal mine on the distribution and movement of elephants using geospatial approaches to formulate an effective mitigation plan.

Location:
Angul Forest Division (2824 km^2), Odisha.

Methods:
The elephant distribution range was estimated by the 'Minimum Convex Polygon' (MCP) method from annual movement record. The habitat use was calculated by the Kernel Utilisation Distribution (KUD) method within the MCP. We used movement data from 2018 to 2022. Habitat Suitability Model was performed using the MaxEnt (Maximum Entropy) method to ensure suitable habitats. In addition, conflict data from the forest department was collected to identify potential conflict hotspots

Results:
The elephant movement were recorded by forest department staff on daily basis and uploaded to a central database using an android based application (iWLMS). A total of 5025 location points were used for this study. The distribution range of elephants in the Angul division was 2749 km^2 (95% MCP) which was 97.34% of the area of the Angul forest division (2824 km^2). The area of intensive utilization using 95% KUD was 1479 km^2 which was 53.80% of the distribution range (95% MCP) or 52.37% of the entire Angul division. The MaxEnt result (AUC 0.86) indicates factors like precipitation of the wettest quarter (Bio 16), green cover and agricultural fields (NDVI), and minimum temperature of the coldest month (Bio 6) to be highly influential.

If the proposed mine is established, it would affect the 170 km^2 (11.49%) of the 95% KUD within a 10 km buffer. In the worst-case scenario, if all 66 coal mines are established in the future, it could affect 641 km^2 (43.34%) of 95% KUD within a 10 km buffer. The conflict data shows that the proposed coal mine area is already a Human-Elephant Conflict (HEC) hotspot and may exacerbate in future.

Conclusion:
There are knowledge gaps pertaining to movement ecology of elephants in the landscape, hence long-term research to understand the movement pattern is essential. Until then efforts to ensure habitat connectivity and a stringent and transparent monitoring mechanism for compliances to the clearance conditions accorded by statutory bodies must be carried out.

Project Title:
Preparation of wildlife management plan with special emphasis on elephants for the proposed Naini open cast coal mine project in Angul Forest Division, Odisha

Principal Investigator(s):
Dr. Gopi. G.V.

Researcher(s):
Karthy. S.
(Project Associate -I)
Dr. Frank Sadrack Jabaraj
(Project Scientist-I)
Dr. Justus Joshua
(Subject Matter Specialist)
Dr. S.F. Wesley Sunderraj
(Subject Matter Specialist)

Funding Agency:
Singareni Collieries Company Limited

Project Duration:
10 months

Key Words:
Human-Elephant Conflict, Habitat connectivity, Coal mine effect, Kernel Utilisation Distribution

Twitter Handles:
@moefcc, @wii_india, @gopigv @karthysp08

Tweet:
Formulating a robust wildlife management plan is key to mitigate the negative effects of mining, through understanding of the underlying issues pertaining to Human-Elephant Conflict.

Project Title:
Assessing the ecosystem services provided by colonial nesting waterbirds in and around select wetlands of Tamil Nadu

Principal Investigator(s):
Dr. G.V. Gopi

Researcher(s):
Alex Jacob
(Junior Research Fellow)

Funding Agency:
DST-SERB

Project Duration:
3 years

Agrarian Avian Assembles: Exploring the relationship between heronries and agricultural lands in Tamil Nadu

Alex Jacob

Aim:

This study investigates the role of colonial nesting waterbirds, particularly in heronries, as indicators of wetland health in Tamil Nadu, India. With 19 colonial nesting waterbird species breeding in 101 heronries in the state, the study aims to assess waterbirds' influence in the nutrients influx in wetlands and adjoining fields, linking biodiversity and agriculture. The hypothesis posits that heronry presence affects wetland nutrient levels, influencing water quality, sediment, agriculture, and productivity.

Location:

The study was carried out in seven select wetlands in six districts of Tamil Nadu, where agriculture is the primary livelihood, sustaining over two-thirds of rural households, particularly small and marginal farmers. The selected sites were surveyed during October 2022 to May 2023.

Methods:

We carried out surveys every 21 days to count birds and nests, and roosting bird numbers at 12 selected heronries during the peak breeding season (Oct-May) using visual estimation. In the next state of the study, we intend to conduct a questionnaire based survey with the local farmers to evaluate their perception on waterbirds' influence on agricultural productivity. Also, we will estimate nutritional content of the soil and water in the selected wetlands.

Results:

Across the seven sites, we recorded 19 waterbird species of which 17 were found to be nesting. Interestingly, no waterbirds were observed in five wetlands throughout the surveys, possibly due to low water levels. Asian Openbill and the Near-threatened Black-headed Ibis were the most abundant water birds while Red-naped Ibis, Great Egret, and Intermediate Egret were least abundant. The Glossy Ibis, though breeding in small numbers, was observed in high numbers in roost. Local farmers reported the use of droppings as natural fertilizers in recent years.

Findings:

The absence of waterbirds in certain wetlands due to low water levels highlights the impact of low rainfall years on the nesting behaviour of waterbirds. In the next phase of the study, drones will be used to better count the species in the wetlands. Water and soil samples will also be collected to assess nutrient inputs. With intensive farmers' surveys, this study will provide detailed ecological information on the ecosystem services provided by the colonial nesting waterbirds on the nearby fields.

Keywords:
Ecosystem Services, Waterbird Loading, Colonial Nesting, Wetland Management

Twitter Handles:
@moefcc, @wii_india, @gopigv, @AlexJacob11

Tweet:
This ongoing study focuses on assessing the impact of the presence of colonial nesting waterbirds on the wetlands and agriculture in Tamil Nadu, India! #WetlandHealth #WaterBirdsOfTamilNadu #EcosystemServices

Nesting population assessment of three species of critically endangered *Gyps* vultures across the Indian region

Harshal Waghmare

Three species of Asian *Gyps* vultures underwent a catastrophic population decline of nearly 97% across their range. This was attributed to the veterinary use of NSAIDs drugs like Diclofenac, Aceclofenac, Nimesulide and Ketoprofen. With the ban on the veterinary use of Diclofenac, the decline in the vulture population is said to have stabilised though it is still critical. To understand the present status of vulture populations, MoEF&CC under the IDWH Scheme through WII initiated a nationwide assessment of vulture populations.

The aim is to carry out a nationwide assessment of nesting populations among three critically endangered *Gyps* vulture species. A literature review was conducted to list and map all the known nesting sites, followed by field survey to collect data on site characteristics and threats. Additionally, information on carcass dumping sites or foraging grounds in been collected.

This assessment, which is currently underway, five states have been surveyed till now. A total of 114 nesting sites were recorded of which 100 were found to be active. *Gyps indicus* occupied 732 active nests across 60 sites, while *Gyps bengalensis* had 241 nests across 29 sites. The lowest number of nests was recorded for the *Sarcogyps calvus* with only 3 active nests at 3 sites. While 11 nests at 7 sites were recorded for the *Neophron percnopterus*. Garadia Mahadev site in Chambal Wildlife Sanctuary in Rajasthan was found to host the largest nesting colony of *G. indicus* with 150-200 nests records during the breeding season, while 49 nests were located with adults and juveniles in the non-breeding season. In Kangra District, Himachal Pradesh, Lalpur site was found to have the largest colony of *G. bengalensis* with 40 nests (35 active), marking the largest recorded colony for the species.

The data generated will form a baseline for long-term monitoring, critical for understanding the nesting status at site, region, and thereafter for the entire India. This study will establish a Centralized National Vulture Database to better manage vulture nesting sites in the future. The ongoing surveys are focused on covering the remaining 13 States where all the vulture nesting records are available from India.

Project Title:
PAN India Assessment and Monitoring of Engendered Species under the Integrated Development of Wildlife Habitat (IDWH) - Vultures

Principal Investigator(s):
Dr. R. Suresh Kumar
Dr. Gauram Talukdar

Researcher(s):
Harshal Waghmare
(Project Associate -1)

Funding Agency:
CAMPA

Project Duration:
1 Year

Keywords:
NSAID, Carcass, Database, Long-term monitoring, Conservation

Twitter Handles:
@moefcc, @wii_india

Tweet:
NA

Project Title:
Basic study design of biodiversity assessment for Himachal Pradesh.

Principal Investigator(s):
Dr. Salvador Lyngdoh

Researcher(s):
Arnab Chattopadhyay;
Project Biologist

Funding Agency:
Japan International Corporation Agency(JICA)

Project Duration:
January 2021 - October 2023

Illustrating changes in avian composition across altitudinal gradients of selected protected areas of Himachal Pradesh

Arnab Chattopadhyay

Aim:

This study aims to investigate the influence of elevation gradients on avian species diversity across three protected areas in Himachal Pradesh, specifically focusing on how bird species composition changes along elevation zones and highlighting the importance of elevation in shaping and conserving unique biodiversity patterns.

Location:

The study has been carried out at Col. Sher Jung National Park, Churdhar Wildlife Sanctuary, and Pin Valley National Park situated in Himachal Pradesh.

Methods:

The survey approach involved 2 km (approx.) transects per zone, with 12 point count stations with each point spaced at 200-meter intervals. To prevent duplicate counts, a minimum distance of 500 meters was kept between adjacent transects. Bird observations were conducted within a 50-meter radius in the early morning hours during the summer (April-June) and winter (December- February). Bird densities at each site were estimated using the software "Distance". Avian feeding guilds were recorded by direct observation. The bird surveys were conducted in three distinct elevation bands: low (400 m-660 m), mid-elevation (2500 m-3500 m), and high elevation (3500 m-4000 m).

Results:

A total of 242 bird species were documented across various elevation zones. Notably, the greatest species diversity was observed in the low-mid elevation areas. In contrast, high-elevation sites displayed lower species richness; nonetheless, a limited number of species dominated these regions exclusively and were absent at lower elevations. Churdhar WLS and Pin Valley NP hold the maximum (251 birds/sq. km. in summer; CV- 19.28) and minimum (16 birds/ sq. km.,CV- 20.48) densities of birds, respectively.

Conclusion:

The study reveals the significant influence of elevation on avian diversity in two protected areas of Himachal Pradesh. The varying species composition along elevation gradients underscores elevation's role in shaping avian biodiversity, necessitating tailored conservation strategies for the preservation of unique avian communities across different elevation zones.

Key Words:
Elevation gradient, Avian diversity, Species composition, Point count, Avian feeding guild.

Twitter Handles:
@moefcc, @wii_india, @jica_direct_en , @Himalayanwolf1 , @ArnabChattopa16

Tweet:
The scientific poster representing the avian component in the biodiversity assessment project at WII (funded by JICA), illustrated compelling patterns of bird assemblages across elevation gradients in Himachal Pradesh.

Status and distribution of mammalian fauna in the corridors of Kaziranga-Karbi Anglong landscape, Assam, India

Mujahid Ahamad

Aim:
Corridors play an important role as a structural and functional connectivity of fragmented landscape and are the key component in maintaining the biodiversity. Thus, the study emphasizes to evaluate the functionality of the corridors by understanding the associated unexplored biodiversity, particularly at the landscape level.

Location:
The Kaziranga-Karbi Anglong Landscape (KKAL), situated within the Indo-Burma biodiversity hotspot, is a region of immense ecological significance. The study was conducted in the corridors namely Panbari, Haldibari, Kanchanjuri and Amguri of KKAL.

Methods:
The camera trap study was conducted between 2021 to 2022, within KKAL corridors. A spatial capture-recapture framework was used, and camera traps were strategically positioned at grid centroids having a grid size of (2 x 2) km^2 for 6,407 camera trap nights.

Results:
Analysis of 6,407 camera trap nights' unveiled 28 mammalian species including four categorized as endangered, six as Vulnerable, one as Near Threatened, and others as Least concern by the IUCN Red List. Among carnivores, common leopard (1.88) shows the highest RAI followed by Bengal Tiger (0.79). Whereas, among herbivores, Barking deer is the most frequent corridor user (RAI =19.09), followed by Asian elephant (RAI = 7.62). The frequently captured species were the Asian elephant, barking deer, hog deer, Asiatic wild buffalo, Bengal tiger, and common leopard. While the tiger's presence was recorded in multiple corridors, absence was noted in Panbari. Remarkably, the Asiatic black bear's presence was documented in the Kanchanjuri corridor for the first time.

Conclusion:
The camera trap study conducted within the Kaziranga-Karbi Anglong Landscape highlighted its rich mammalian biodiversity and corridor dynamics. The historical ecological continuity of the Karbi-Anglong forests and Kaziranga Tiger Reserve grasslands has been perturbed by anthropogenic factors, accentuating habitat fragmentation. The intrusion of the National Highway-37, severing this historical linkage, stands emblematic of the challenges faced by this landscape. The challenges posed by habitat fragmentation and human encroachment underline the urgency of conservation efforts to protect this important landscape.

Project Title:
Conneting the Dots: Finding dispersal corridors for tiger in Kaziranga-Karbi Anglong Landscape, Assam

Principal Investigator(s):
Dr. Ruchi Badola
Dr. S.A. Hussain
Dr. Gopi G.V.

Researcher(s):
Mujahid Ahamad, Jyotish Ranjan Deka and Priyanka Borah (Project Fellows)

Funding Agency:
National Tiger Conservation Authority (NTCA)

Project Duration:
2019-2025

Key Words:
NA

Twitter Handles:
@moefcc, @wii_india, @moefcc, @wii_india, @Mujahid62055321, @kaziranga_

Tweet:
How do large mammals utilises the corridors of Kaziranga-Karbi Anglong Landscape? Here we presented the camera trap study conducted within the KKAL highlighting its rich mammalian biodiversity and corridor dynamics.

#kaziranga #tigers #corriodors

Project Title:
Supporting trans-boundary recovery of tigers in India and Nepal

Principal Investigator(s):
Dr. Bilal Habib

Researcher(s):
Dr. Naveen Chandra Joshi (Project Scientist-II),
Ajay Chauhan (Project Associate-II),
Dr. Harish Guleria (Project Manager)

Funding Agency:
IUCN-KfW and Zoological Society of London (ZSL)

Project Duration:
July 2021-Aug 2023

Keywords:
Capacity building, wildlife corridor, MSTrIPES, Human-Wildlife Conflict, Community

Twitter Handles:
@moefcc, @wii_india, @moefcc, @wii_india, @ZSLconservation, @wii_india, @ukfd_official, @NandhaurWLS, @OfficialZSL, @N_C_Joshi, @wildwithwolves, @GuleriHarish

Tweet:
#NandhaurWLS is leading the way in tiger conservation efforts. 🐯🌿 Kudos to the unsung heroes – the forest staff and local communities, whose empowerment and dedication are the heart of tiger conservation in Nandhaur. 🐾🌲

Roaring Progress: A comprehensive update on strengthening tiger Conservation in Nandhaur Landscape

Dr. Naveen Chandra Joshi

Aim:
The aim of the project is to harmonize conservation and livelihoods in Nandhaur transboundary landscape

Location:
Nandhaur Wildlife Sanctuary (NWS) and adjoining landscape in Uttarakhand

Methods:
Eight training workshops on patrol-based monitoring using MSTrIPES were conducted for front-line staff of NWS during Sept 2021 to June 2023. The capacity building resulted in the monitoring of tiger and prey by frontline staff following the standard capture-recapture framework (camera-trap). Various awareness programmes were conducted for community members and school children. Pre and Post-intervention impact was measured using questionnaire surveys carried out in 2021 and 2023 respectively.

Results:
A total of 240 front-line staff from the Haldwani and Champawat Forest Divisions have been trained in ecological and biological monitoring using MSTrIPES and setting camera traps. The monitoring by the staff resulted in the capture of a total of 36 unique individuals of tigers in 2022, with a tiger density of 4.68±0.79/100 km^2, using camera traps. Based on the conflict hotspot mapping, twelve early warning systems have been deployed, which has resulted in a 72% decrease in crop depredation by elephants. A total of 43.54% (n=192) of community members who took training programs on fodder production and a well-developed enterprise-led development program like apiculture, incense stick making, jute bag making, sewing and stitching, beautician, etc., driven by the local community have started their production resulting in reduced biotic pressure on NWS. The message of tiger conservation was delivered to a total of 1384 students, 2497 people from Nandhaur Landscape, and 3704 villagers from 4 village panchayats of Champawat district. Staff-driven monitoring also resulted in photo capturing of two new species (Crab-eating mongoose and Fishing cat) from the study area for the first time.

Conclusion:
The project's significant success includes introducing the villagers to the various aspects of conservation, such as ecosystem and biodiversity conservation, and sustainability. Post workshops, target communities developed a better understanding of the benefits of conservation. The capacity building through training exercises for the front-line staff has resulted in much-enhanced monitoring activities with better patrolling efforts.

Status of Indian Leopard (*Panthera pardus fusca*) in Palamau Tiger Reserve, Jharkhand, India

Rohan Desai and Shahzada Iqbal

Aim:
Leopards have seen a significant reduction in their natural habitat, despite their remarkable ability to adapt to various diets and behaviours. One crucial aspect of leopard conservation efforts is the need for accurate estimates of their abundance. The present study assessed the status of Leopard (*Panthera pardus fusca*) using camera traps in Palamau Tiger Reserve, Jharkhand, India.

Location:
Palamau Tiger Reserve spread over 1129.93 sq. km is located on the western side of Latehar district on the Chotanagpur Plateau in Jharkhand and was amongst the first nine tiger reserves in India.

Methods:
Large carnivores are elusive creatures with low population densities which makes it challenging to accurately estimate their numbers. To address these challenges, a grid-based camera trap sampling was conducted in Palamau Tiger Reserve and we used a more reliable technique, the spatially explicit capture-recapture (SECR) framework, which is increasingly being employed to overcome the limitations of traditional capture-recapture methods used for estimating the concentrations of large carnivores.

Results:
An effort involving 17,765 trap nights using 323 pairs of camera traps resulted in the capture of 786 Leopard images along with other animals like Asian Elephant, India Gray Wolf, Sloth Bear, Striped Hyena etc. A total of 24 unique leopards were identified using the software ExtractCompare. Analysis was done using package SECR in program R. Based on our analysis, we estimated the leopard density to be 3.85 (1.01) per 100 km^2.

Conclusion:
Our study reveals that the leopard density has increased significantly from the last cycle (2018/19). If the prey biomass is restored and the anthropogenic pressure reduced, it can sustain higher leopard density and even tigers. Our findings emphasize the critical importance of employing research on large carnivores in safeguarding biodiversity, particularly in regions facing unique challenges.

Project Title:
Identifying corridors in & around Palamau Tiger Reserve

Principal Investigator(s):
Qamar Qureshi,
Dr. Vishnupriya Kolipakam

Researcher(s):
Rohan Desai (Project Fellow)
Shahzada Iqbal
(Project Associate I)

Funding Agency:
Jharkhand Forest Department

Project Duration:
2 Years

Key Words:
Camera Trap: Palamau Tiger Reserve: Leopard: SECR

Twitter Handles:
@moefcc, @wii_india,
@wii_india @rohankanhaai

Tweet:
NA

Project Title:
Recovery of Dugongs and their habitats in India: An integrated participatory approach

Principal Investigator(s):
Dr. J. A. Johnson
Dr. Nehru Prabakaran
Dr. K. Sivakumar

Researcher(s):
Sameeha Pathan (Project Fellow and PhD Scholar)

Funding Agency:
CAMPA

Project Duration:
2016-2025

Unveiling Dugongs' Culinary Choreography: Foraging strategies in the ever-shifting seas of Gulf of Kachchh's (GoK) Gujarat Reef Complex

Sameeha Pathan
Gem Christian, Oishinee Chakraborty,
Dr. Nehru P. K. Sivakumar and Dr. J.A. Johnson

Aim:
Marine herbivory in a reef system distinctly differs from their terrestrial counterparts in that the foraging pastures tidally affected. The objective of this study was to investigate the remnant dugong populations, tidal awareness and foraging strategies to avoid low-tide stranding

Location:
We studied and mapped the spatial extents and vegetation densities of over 15 seagrass habitats. Mapped habitats are of different colonization depths and topography across the reef complexes of the south-western Gulf of Kachchh; a close-knit system of critical dugong habitats in the eastern Arabian sea.

Methods:
By tracking dugongs' foraging trails scars (n= 834), we assessed their habitat preferences based on the forage seasonality, deep sea refuge to foraging trail distance, and depth profiles of the seagrass meadows. We investigated the presence of tidally synchronized foraging patterns and understand the relative availability at different lunar days. For this Inverse Distance Weight (IDW) was used to construct local bathymetric maps for a Mean High-Water Spring (MHWS) tide (3.4 mts) and Mean Low-Water Spring (MLWS) tide (0.4 mts), and intermediate tide (2.4 mts) of 9 intertidal, 3 mid-intertidal and over seven subtidal meadows

Results:
Results show that ~80% of the total foraging pastures of the reef-inhabiting dugong population are tidally affected. Reef-top meadows (RTM) of higher forage density become inaccessible at neap days (12-17 days/month). Dugongs restrict foraging on back-reef parts of RTM's, closer to deep water (2-3 mts MLWS) refuges (600-1000 mts from refuge). Contrarily, the interiors of a low-elevation tidal-creek meadows (TCM) are accessed by utilization of an intricate network of tidal channels and gullies that dissect these seagrass habitats. However, foraging was restricted to meadows flanking the tidal creeks (260-300 mts from the refuge). TCMs' low-elevation made these habitats accessible even at neap high tides. Subtidal meadows were preferred mostly during the low-tide period

Conclusion:
The population base their foraging habitat preferences on the relative ease of accessibility to a foraging meadow. We conclude that tidal awareness and attunement to it is the key to optimal foraging on tidally affected pastures.

Keywords:
Tides, Marine herbivory, seagrasses, Arabian sea

Twitter Handles:
@moefcc, @wii_india, @nehrutp, @jajohny2013, @ksivakumarwii, @DugongProject

Tweet:
"Unveiling Dugongs'Culinary Choreography: Discover the fascinating foraging strategies of Sea Cows in the ever-shifting seas of Gulf of Kachchh's (GoK), Gujarat Reef Complex. Dive into their world as they navigate in search of seagrass.

Bridging the gap: A Railway rethink for long-term Gibbon Conservation

Rohit R. S. Jha

Aim:
The western hoolock gibbon (*Hoolock hoolock*) (Endangered, Sch.-I) population within the Hollongapar Gibbon Sanctuary (HGS) is fragmented by an as yet un-electrified 1.65 km-long single-track broad gauge railway (Lumding-Dibrugarh section). We aimed to provide a detailed design for canopy bridges' siting and installation towards facilitating gibbon movements across the railway-imposed canopy gap.

Location:
The Hollongapar Gibbon Sanctuary (HGS) is a relatively small (20.98 sq.km) lowland rainforest habitat in Assam's Jorhat district. It is primarily a semi-evergreen forest with wet evergreen patches.

Methods:
A comprehensive literature survey on the utility of canopy bridges for arboreal mammals worldwide with particular focus on gibbon species was conducted. Upon finalisation of artificial canopy bridge (ACB) as the most suitable strategy, field assessment within HGS consisted of several walks along the railway track with experienced field staff to identify potential ACB locations. Each location was further surveyed to identify suitable "post" and "web" trees for anchoring/ tying rope-based ACBs, take relevant measurements and physically mark the trees. A multi-stakeholder meeting helped incorporate concerns raised by the Indian Railways into the ACB design.

Results:
Seven (07) potential locations for installation of double-rope ACBs (with safety nets underneath) within HGS were identified. The average post tree (n = 14, two each at the seven suggested ACB locations) height is 30.71 m (range: 25.5-37.5 m) while their average girth at breast height (GBH) is 3.08 m (range: 1.8-4.75 m). The average height at which knot points for ACB anchoring on post trees are available is 19.55 m (range: 13.25-25.0 m), while the average ACB span over the railway track (post-post trees' double-rope connections) is 56.16 m (range: 36.63-69.1 m).

Conclusion:
The present situation at the Hollongapar Gibbon Sanctuary necessitates implementation of a first principles' (avoidance) based conservation strategy in the face of impending railway track electrification and future doubling. While ACB installation is a must in the interim along with reforestation, moving the relatively small track from within HGS to available non-forest land outside is key to securing the gibbon's long-term future.

Project Title:
Artificial Canopy Bridge design to facilitate Western hoolock gibbon (*Hoolock hoolock*) crossing over Mariani-Dibrugarh broad gauge single track Railway line in Hollongapar Gibbon Sanctuary, Assam

Principal Investigator(s):
Dr. G.V. Gopi
Department of Environment & Forest, Government of Assam
Ministry of Railways, Government of Bharat

Researcher(s):
Rohit R.S. Jha
(Senior Project Associate),
Stanzin Zangmo
(former Research Intern)

Funding Agency:
Department of Environment and Forest, Government of Assam

Project Duration:
November 2022 to May 2023

Keywords:
first principles' conservation, linear infrastructure, habitat fragmentation, avoidance primacy, artificial canopy bridges

Twitter Handles:
@moefcc, @wii_india, @RailMinIndia, @CMOfficeAssam, @assamforest, @DfoJorhat, @RailNf, @aaranyak, @IUCNssc, @IUCN_Gibbon, @nandhakumarn, @dilip_aaranyak, @rrs_jha, @stanzin_zaangmo, @gopigv, @vrtiwari1

Tweet:
Check our poster at #ARS2023 arguing for rerouting of the single-track railway from #HollongaparGibbonSanctuary as most viable long-term strategy to conserve #WesternHoolockGibbon; rope-based #artificialcanopybridges will help meanwhile. #WIIEIACell

Project Title:
Planning and management for aquatic species conservation and maintenance of ecosystem services in the Ganga River basin

Principal Investigator(s):
Dr. Ruchi Badola

Researcher(s):
Ruchika Sah (Project Associate), Pooja Choudhary (Project Fellow), Megha Khanduri (Project Assistant), Mebin aby Jose (Project Assistant), Bhawna Sharma (Project Assistant), Kirti Banwala (Project Assistant), Sarita Bora(Project Assistant), Chitra Paul (Project Assistant), Samridhi Gururani (Project Assistant)

Funding Agency:
National Mission For Clean Ganga, Ministry of Jal Shakti

Project Duration:
January 2020-December 2024

The Tale of toxic trails: Tracing contamination patterns of endocrine disrupting compounds (EDCs) in habitats of threatened apex predators within the Ganga River Basin

Richika Sah, Pooja Choudhary, Megha Khanduri, Mebin aby Jose, Bhawna Sharma, Kirti Banwala, Sarita Bora, Chitra Paul, Samridhi Gururani

Aim:
The occurrence of endocrine-disrupting compounds (EDCs) in aquatic environments has emerged as a critical ecological concern due to their persistent, bioaccumulative, and toxic properties. Even at very low concentrations, they may cause disruptions in reproduction and development across multiple aquatic species, resulting in observable shifts in regional populations. Despite their well-documented impacts on diverse taxa, including apex predators, the state of research in India concerning the threats of EDCs to freshwater biodiversity remains alarmingly inadequate. Therefore, the present study aims to quantify the occurrence, and potential ecological risks of EDCs in the critical habitats of threatened apex predators, like Gangetic dolphins, Gharial, and Otters, within the Ganga River Basin (GRB).

Location:
Multiple sites within Ghaghra, Gandak, Kosi, and Chambal were selected, for the present study based, on land-use patterns, anthropogenic pressures, and the distribution of apex predators.

Methods:
Surface water samples were collected in the year 2021 (October-November) following standard protocols. Ultra-performance liquid chromatography/gas chromatography-tandem mass spectrometry was used to quantitatively analyze trace levels of diverse EDC classes, such as pharmaceuticals (17α-ethynylestradiol), anti-microbials (Triclosan), and plasticizers (Bisphenol A). Multi-tier ecological risk assessment approach was utilized for the identification of vulnerable and high-ecological risk zones.

Results:
Ghaghra showed the highest EDCs contamination (<DetectionLimits-102.981 ng/L), followed by Kosi, Gandak, and Chambal, with the contamination pattern in the order of Bisphenol A>Triclosan>17α-ethynylestradiol. Pollution hotspots reveal inputs from both direct and indirect sources, irrespective of settlement type (urban/rural). EDC mixtures pose a low to medium risk to aquatic diversity.

Conclusion:
This is the first study to document both the presence and ecological risks posed by EDCs in the habitats of threatened apex predators, within GRB, while identifying the areas that demand urgent and constant management and mitigation efforts. The study highlights the pivotal role of protected areas in pollution management and reduction. The findings hold the potential to significantly shape and influence ongoing conservation efforts aimed at protecting threatened apex predators.

Key Words:
Bioaccumulative, Gangetic Dolphin, Pollution, Gharial, Ecological Risk Assessment

Twitter Handles:
@moefcc, @wii_india, - @moefcc, @wii_india, @RuchiBadola2, @CallingGanga

Tweet:
Dive Deeper, Explore More! Embark on a Thrilling Expedition with Our Endocrine Disruptors Research, as we explore their Potential Impact on Ganga River Basin's Critical Habitats #Pollution #GangeticDolphin #Gharial #GangaRiverBasin

Pachyderms in Plantations- Ranging patterns and habitat use of Asian elephants (*Elephas maximus indicus*) in an Agroforestry Landscape of Southern Karnataka

Souritra Sharma

Aim:
Asian elephants inhabit a diverse range of modified landscapes, indicating that their habitat preference influences their ranging patterns. Therefore, conservation of the species requires management both in and outside protected areas.

Location:
We conducted our research in Karnataka's Kodagu and Hassan districts, by tracking elephant movements, and agricultural and property damage incidences.

Methods:
Our study followed thirteen radio-collared elephants in plantations adjacent to protected area, plantations in human-dominated areas, and protected area (PA). Similarly, nine male elephants, that were in conflict, were also radio-collared and translocated to other PAs. MCP, KDE, and BBMM methods were applied to analyze the home ranges. Hotspot analysis was also conducted from conflict incidences.

Results and Conclusions:
Hotspot analysis revealed that human-elephant conflict instances seemed to have spread to novel areas. In case of elephants residing in plantations adjacent to the protected area, the average home range of females (48.74 ± 13.53 km^2) was significantly higher than males (27.34 ± 0.66 km^2), probably due to the latter being lone bulls. Additionally, the home range was almost double in human-dominated areas (97.16 ± 16.84 km^2) than those in PAadjacent plantations, highlighting productive feeding zones when annexed with PA, reducing human interactions. Interestingly, the home range of the female elephant exclusively in PA (91.24 km^2), exhibited a higher home range area than that of the elephant utilizing both PA and plantations (59.78 km^2). As for the male elephants in PA, the home range and daily movement (51.20 ± 13.32 km^2; 5.84 ± 2.11 km) were significantly higher than the males (27.34 ± 0.66 km^2; 3.59 ± 1.4 km) of PAadjacent plantations, with occasional movement from PA to neighbouring plantations. The translocated male elephants exhibited a higher average home range (221.71 ± 174.78km^2) than resident elephants, probably due to their exploratory nature and their home range areas not yet being stabilized. This exhibits adaptable foraging based on food availability, emphasizing the importance of having refuge patches in human-dominated areas, that will reduce conflict and human interaction.

Project Title:
Population management of species involved in Human Wildlife conflict

Principal Investigator(s):
Qamar Qureshi,
Dr. Lallianpuii Kawlni,
Dr. Vishnupriya Kolipakam,
Dr. Kafil Hussain

Researcher(s):
Souritra Sharma
(Project Fellow & PhD Scholar),
Dr. Sanath Krishna Muliya
(Project Scientist),
Mariyam Nasir (Project Fellow),
Dr. Thammaiah CK
(Project Associate),
Chethan CM (Project Assistant),
Dr. Priya Gusain (Project Scientist)

Funding Agency:
Ministry of Environment, Forest and Climate Change, Government of India

Project Duration:
2018-2023

Keywords:
Radio-collaring, human-dominated, foraging

Twitter Handles:
@moefcc, @wii_india,
@SharmaSouritra,
@muliya_sanath,
@V_kolipakam,@lalanikawlni
@wii_india,@aranya_kfd,
@giz_india,@IndiaHSI,@moefcc

Tweet:
@wii_india &
@aranya_kfd supported by
@giz_india &
@IndiaHSI, radio-collared 22+ 🐘
in Kodagu & Hassan, Karnataka for insights into movement & habitat use #earlywarningsystem
@moefcc @muliya_sanath
@SharmaSouritra @lalanikawlni
@V_kolipakam

Project Title:
Mangrove responses to sea level change along a gradient of tectonic subduction – A multi-disciplinary approach

Principal Investigator(s):
Dr. Nehru Prabakaran

Researcher(s):
Project Associate II

Funding Agency:
Department of Science and Technology

Project Duration:
2018-2023

Keywords:
Disturbance; introduced species; mangrove recovery, new intertidal areas; subsidence

Twitter Handles:
@moefcc, @wii_india, @moefcc, @wii_india, @Thiru771 @nehrutp @AnoopRajSingh23 @GGnanasekaran11 @AndamanForests

Tweet:
#Invasive #chital a major constraint for vegetation recruitment pattern across the #Andaman Islands. @Thiru771 explores the Chital impacts on #mangroves recovery following the 2004 tsunami from South Andaman. @moefcc @AndamanForests #Ecosystem impact

Impact of herbivory pressure Chital (*Axis axis*) on the mangroves of the Mahatma Gandhi Marine National Park, Andaman Islands

Thirumurugan V.

Aim:

An invasive species herbivory can adversely influence the vegetation dynamics and ecosystem processes. Understanding such effects will be crucial for managing and conserving any natural ecosystems. The present study aims to assess the impact of chital, an invasive herbivore, on the mangrove vegetation in Mahatma Gandhi Marine National Park (MGMNP), Andaman Islands, which is recovering from large-scale natural disturbance caused by the 2004-Indian Ocean Tsunami.

Location:

The Mahatma Gandhi Marine National Park (MGMNP), Andaman Islands.

Methods:

Linear transect were used to study the impact of herbivory in 12 mangrove sites. In each site, three transects (250 m long) were laid. In each transect, six (7 m circular) plots were laid with a distance of 50 m interval that covers the landward, ecotone, and seaward zones. In all the plots, the total number of trees, saplings, and seedlings grazed, browsed, and tramped by chitals was recorded to understand the impact of herbivory pressure in MGMNP.

Results:

A total of 25 true mangrove species (12 families and 17 genera) were enumerated from MGMNP, which includes 1890 trees, 758 saplings, and 4102 seedlings. Of which 17 species representing 3% of trees, 56 % of saplings, and 25 % of seedlings (relative abundance) were affected by chital herbivory. All plant parts (leaves, bark, pneumatophores, young shoots, propagules) were preferred by chital. *Avicennia marina and Rhizophora apiculata* are the two most frequently browsed species, while *Ceriops tagal and Lumnitzera racemosa* were least browsed and were most abundant. The intensity of herbivory pressure declined linearly from landward to seaward mangrove zone.

Conclusion:

The chital herbivory limited the mangrove recovery in MGMNP, especially in the landward mangrove zone. Mangrove species that are less preferred by chital (e.g., *Ceriops tagal and Lumnitzera racemosa*) have a better chance of colonizing the mangrove-degraded areas created after the 2004 Tsunami. Necessary management interventions towards reducing the chital herbivory needs to be implemented to improve the mangrove recovery in MGMNP.

Status of meso-carnivores with a focus on clouded leopard in Buxa Tiger Reserve, West Bengal

Shekhar Sarkar

Aim:
Mesocarnivores play an important role in the ecosystem influencing the structure and function of species dynamics. In India, they have received limited conservation focus. This study sheds light on the diversity of mesocarnivores, their abundance and distribution in a human-dominated landscape with special focus on the elusive clouded leopard.

Location:
The study was conducted in Buxa Tiger Reserve (BTR), situated in Alipurduar district of northern West Bengal.

Methods:
Systematic camera trapping was done from 2019 to 2023. Camera trap photographs with time stamps and GPS of the locations were used to understand the spatial distribution of these (Leopard cat, Jungle cat, Asian golden cat, Marbled cat and Clouded leopard) mesocarnivores. Relative abundance index was calculated for each of these five species. Activity pattern of clouded leopard in comparison to other mesocarnivores was observed using the "overlap" package in R.

Results:
A total of 2012 camera trap images of these five mesocarnivores were recorded from the BTR. The leopard cat showed the highest relative abundance index (2.36) followed by jungle cat (0.16), clouded leopard (0.14), marbled cat (0.12) and golden cat (0.11). Despite their elusive, arboreal nature and limited presence within the reserve (31%), clouded leopards displayed a significant relative abundance over the years. They were strictly nocturnal and showed the highest temporal overlap ($\Delta = 0.71$) with wild pig.

Conclusion:
BTR, while being a low-density tiger reserve in India, demonstrates remarkable diversity within the mesocarnivore community. This underscores the necessity for focused studies on individual species within the reserve. Leopard cats appear to be widespread throughout the reserve, whereas clouded leopards, golden cats, and marbled cats exhibit distinct habitat preferences, occupying specific pockets of high elevation with low human presence within the area. However, the true population abundance of these elusive mesocarnivores remains unknown, emphasizing the requirement for in-depth research.

Project Title:
Augmentation and long-term monitoring of tiger in Buxa Tiger Reserve, West Bengal

Principal Investigator(s):
Dr. K. Ramesh

Researcher(s):
Shekhar Sarkar (Project Fellow), Ankit Thakur (Project Fellow)

Funding Agency:
National Tiger Conservation Authority (NTCA) & West Bengal Forest Department (WBFD)

Project Duration:
March 2018 to March 2026

Keywords:
Mesocarnivores, relative abundance, temporal activity, distribution, camera trap

Twitter Handles:
@moefcc, @wii_india, @moefcc, @wii_india, @shekhar_1708, @aryan2142, @VandanaTomar_17, @kramesh95, @ForestDeptWB

Tweet:
Understanding the diversity and distribution of mesocarnivores with a focus on Clouded leopard in Buxa Tiger Reserve. #mesocarnivores #smallcats #easternhimalayas #cloudedleopard #ARS2023

Project Title:
Long term monitoring of tigers, co-predators and prey in tiger reserves and other tiger bearing areas of Vidarbha, Maharashtra.

Principal Investiga-tor(s):
Dr. Bilal Habib, Dr. Parag Nigam, Smt. Jayoti Banerjee, Dr. Jitendra Ramgaokar, Smt. Sreelakshmi Annabathula

Researcher(s):
Suman Koley (JRF), A. Krishnan (JRF), Jaydeep Patil (JRF), Advaita Ravindran (JRF), Kanishka(Project Associate I), Anubhuti Krishna (Project Associate I), Sajid Reza (Project Associate I), Anjali Thapliyal (Project Associate I), Khadija Sultana (Project Associate I), Shaheer Khan (Senior Project Associate)

Funding Agency:
Maharashtra Forest Department, Govt. of Maharashtra

Project Duration:
2019-2029

Keywords:
Tiger conservation, co-predators, SECR, distance sampling

Twitter Handles:
@moefcc, @wii_india, @moefcc, @wii_india, @bhlab_india, @wildwithwolves, @paragnigam09, @MahaForest, @sumankoley94

Tweet:
NA

Monitoring of tigers, co-predators, and prey in Vidarbha Landscape, Maharashtra.

Suman Koley

Monitoring of an ecosystem with a combination of modern technology and traditional ecological knowledge provides valuable insights into population dynamics, behavior, and distribution patterns which aids in species conservation and management. This study aims to evaluate the status of tigers, co-predators, and prey, and understand the interspecific interactions in a human-dominated landscape.

Different protected and non-protected tiger-bearing forest areas of the Vidarbha landscape, Maharashtra including five tiger reserves (Tadoba, Navegaon-Nagzira, Pench, Bor, Melghat), two wildlife sanctuaries (Umred-Karhandla, Tipeshwar) and two forest divisions (Bramhapuri, Pandharkawada).

Prey densities were estimated using line transectbased distance sampling. Density surfaces of different prey species were generated using relevant ecological co-variates to understand their distribution pattern within the landscape matrix. Tiger and leopard densities were estimated using the SECR method using camera trap data. The density surface of tiger and leopard were generated, and a quantile regression analysis was performed to obtain the relationship between tiger and leopard densities.

Densities of tigers (0.5-6.6/100 sq.km) and leopards (1.1- 11.6/100 sq.km) varied across the landscape. The highest spotted deer density was found in Pench Tiger Reserve (16.53/sq.km), and the highest sambar density was found in Bor Tiger Reserve (9.97/sq.km). Quantile regression analysis between tiger and leopard in low tiger density areas showed that leopard density increased at low tiger density and stabilized later, while in high tiger density areas, it increased with the tiger density. Variations in the densities depend on the different environmental and anthropogenic factors at the local level. The study emphasizes the importance of continuous monitoring and management plans that can adapt to the changing circumstances within this ecosystem.

A decadal insight on population growth of tigers in Panna Tiger Reserve and their future

Supratim Dutta

Aim:
Tiger (*Panthera tigris*) is an indicator species of ecological health and conservation efforts. After local extinction in 2009, and subsequent successful tiger reintroduction, population reached to the carrying capacity and simultaneously dispersed in the greater Panna landscape. Though, tiger was in the central focus in many studies, limited information is available on reintroduced tiger demography, survival probability and movement behaviour. Our aim is to fulfil the knowledge gap of reintroduced tiger and their movement behaviour in the landscape.

Location:
Study was carried out in the Greater Panna Landscape, focusing on Panna Tiger Reserve. Central India.

Methods:
We investigated the demographic and movement characteristics of tigers by using radiotelemetry and camera trap data. We estimated demographic parameters such as litter size, inter-birth interval and survival probability. We adopted age-specific survival model in Bayesian framework to determine the age-specific mortality trajectory of the reintroduced population. To determine the movement behaviour, we used Hidden Markov Model to model the animal dispersal, and integrated Step Selection Function was used to model the habitat selection of the dispersers.

Results:
We found the mean litter size was 2.66, and the inter-birth interval was 19.16 months, with survival probability of 82%. We observed non-constant mortality trajectories for both the sexes with a moderately higher risk of death in younger (<1 year) and older individuals (>10 years). We found comparatively lower survival rate and higher dispersal rate in males. Dispersers preferred to move through forest patches during night and distinctly exhibited two behavioural states; resting (~32%) and exploratory (~68%). Dispersers avoided the human-dominated areas.

Conclusion:
The reintroduced population recovered quickly and follows similar trajectory like other established tiger population. High survival probability of females, and low cub's mortality helped the population to recover within a short period of time. We recommend collaring and monitoring of disperse individuals to update the disperse routes of functional corridors and potential stepping-stones in the landscape.

Project Title:
Tiger reintroduction & recovery programme in Panna Tiger Reserve, Madhya Pradesh & its Landscape Complex

Principal Investigator(s):
Dr. K Ramesh, Dr. J A Johnson

Researcher(s):
Supratim Dutta,
Kamana Pokhariya
(Project Fellow)

Funding Agency:
NTCA & MPFD

Project Duration:
2009-2021

Keywords:
NA

Twitter Handles:
@moefcc, @wii_india, @DuttaS92, @kramesh95, @wii_india

Tweet:
The recovery journey and the success story of Panna Tigers in Central India. @DuttaS92, @kramesh95, @wii_india, @ntca_india, @PannaTigerResrv, #MPFD, #IRS_2023

Project Title:
Niche selection and mesopredator release in high altitude ecosystems.

Principal Investigator(s):
Dr. Salvador Lyngdoh

Researcher(s):
Priyanka Justa

Funding Agency:
DST-SERB

Project Duration:
February 2021-February 2024

Keywords:
camera trapping, niche, spatio-temporal partitioning, occupancy, diet overlap, competition

Twitter Handles:
@moefcc, @wii_india, @moefcc, @wii_india, @himalayanwolf1, WildlifeHpfd, @serbonline, @IndiaDST

Tweet:
Priyanka unveils carnivore community dynamics in Spiti Valley, exploring interactions between an introduced predator i.e., dog with native predators i.e., red fox, snow leopard, and Himalayan wolf in a trans-Himalayan landscape.
#WII #ARS2023

Interaction patterns among predator guild of trans-Himalayas: What structures a carnivore community in dynamic anthropogenic land-scapes?

Priyanka Justa

Aim:

Predators compete for resources aggressively, forming trophic hierarchies that shape the structure of an ecosystem. Competitive interactions between species are modified in the human-altered environment and become particularly important where an introduced predator can have negative effects on native predator and prey species. The trans-Himalayan region of northern India has seen significant development in tourism and associated infrastructure over the last two decades. While tourism, combined with unmanaged garbage can facilitate red fox (*Vulpes vulpes*), it also allows free-ranging dogs (*Canis lupus familiaris*), an introduced mesopredator to thrive, possibly more than the native red fox. We look at the little-known competitive dynamics of these two meso-carnivores, as well as their intra-guild interactions with the region's top carnivores, the snow leopard (*Panthera uncia*) and the Himalayan wolf (*Canis lupus chanco*).

Location:

We selected five intensive study sites across a range of disturbance gradient within Spiti Valley, Himachal Pradesh.

Methods:

To study interactions between these four carnivores, we performed multispecies occupancy modeling and analyzed spatio-temporal interactions between these predators using camera trap data. We also collected scat samples to calculate dietary niche overlaps and determine the extent of competition for food resources between these carnivores.

Results:

The findings from multispecies occupancy modeling demonstrate that occupancy probabilities of individual species were related both to environmental variables and the presence or absence of other interacting species. However, the extent to which environmental variables versus interspecific interactions contribute to shaping occupancy probabilities varies across the sampled sites.
As anthropogenic impacts increase, we find that these predators coexist in this resource-scarce landscape through dietary or spatiotemporal segregation, implying competition for limited resources.

Conclusion:

Spiti Valley, an extreme cold and arid region in the trans-Himalayas, marked by low species diversity, grapples with the challenges posed by rapid development and a surging tourism industry. Our research contributes valuable insights to the limited ecological knowledge of predators in this dynamic landscape and enhances our understanding of community dynamics within human-altered ecosystems.

Demography of chital in moist deciduous forest of Central India

Shravana Goswami

Aim:
The chital, a key prey for predators like tiger, lion, leopard, and dhole in the Indian subcontinent's forests, holds significance for carnivore conservation efforts. Despite its importance, detailed demographic information beyond destity is lacking. To fill this gap, our study focuses on chital demography, including growth rate, group dynamics, age distribution, breeding season, survival rates, mortality, and reproductive output.

Location:
Kanha tiger reserve is located in the Maikal hills of Satpura range in the Central Indian highland of Madhya Pradesh, India. The area of the inviolate core area is 917 km^2.

Method:
We studied the population dynamics of chital over 10 years wherein annual habitat-specific densities were estimated through line transect-based DISTANCE sampling, fawning and rutting was estimated by weekly sampling the proportion of females lactating and males in different antler stages throughout the year. A sample of 302 skulls was aged based on tooth eruption, wear, and validated with growth rings examined from cross sections, to compute a lifetable.

Result:
The chital population in Kanha was found to be growing at the rate of 5% per annum. Among these, adult females make up 41% of the population. Fawning and lactation happened throughout the year, with the highest in April. On average, 134 ± 3.7 fawns were born each year for every 100 females. The survival rate for these fawns in their first year was 13%. After reaching 6 years of age, the survival rate of adult chital declines rapidly.

Conclusion:
Current population dynamics of chital seems to be in equilibrium with offtake by predators. It would be important to note that removal of chital should be done with precaution as removal of chital from Kanha can potentially push the population into a declining phase, which would be extremely detrimental to the ecosystem and may lead to human-carnivore conflict.

Project Title:
Intensive monitoring of tiger and study of dispersal in Kanha tiger reserve (Phase IV monitoring)

Principal Investiga-tor(s):
Qamar Qureshi,
Dr. Y.V. Jhala

Researcher(s):
Shravana Goswami
(Sr. Research Fellow),
Jayanta Kumar Bora
(Sr. Research Fellow),
Dr. Neha Awasthi
Post Doc Affiliate,
Dr. Ujjwal kumar
(Research Scientist NTCA Tigercell)

Funding Agency:
NTCA

Project Duration:
2009-2026

Keywords:
Demography, age-specific survival

Twitter Handles:
@moefcc, @wii_india, @chital_axis, @Ujjwalwild, @jkborah, @nehawildlife, @TrKanha, @ntca_india, @wii_india

Tweet:
Unveiling the Secret Life of Chital in Central India's Forests @chital_axis delves into the world of this vital prey species. Beyond numbers, we explore Chital's demography. A crucial piece for the carnivore conservation puzzle!

Project Title:
Understanding population dynamics, space use, movement and diet of leopards in Junnar taluka, Maharashtra for human leopard conflict mitigation

Principal Investigator(s):
Dr. Bilal Habib, Mr. Praveen NR. Dr. Parag Nigam, Dr. Samrat Mondol, Mr. Amol Satpute

Researcher(s):
Kumar Ankit (SRF)
Rucha Ghanekar (SRF)

Funding Agency:
Maharashtra Forest Department

Project Duration:
March 2019- March 2024

Keywords:
NA

Twitter Handles:
@moefcc, @wii_india, @moefcc, @wii_india, @Kumar9Ankit, @wildwithwolves, @bhlab_india, @ruchaghanekar, @MahaForest, @nrp_gowda, @paragnigam09

Tweet:
"Leopards of Junnar"- @Kumar9Ankit talks about the ecology of leopards in human-dominated landscape of Western Maharashtra @wii_india studying different ecological aspect of ecology of leopard in Junnar #ARS2023 #WII

"The Gully Boy of Junnar": Ecology of leopards in human-dominated landscape of western Maharashtra

Kumar Ankit

Aim:

Leopard is one of the most adaptable big cats known to thrive across India including the human-dominated and modified landscapes. We are studying the ecology of leopards to understand different ecological aspects such as population dynamics, space use, diet, and movement pattern for management implications in the human-dominated landscape of western Maharashtra which is known for its recent history of human-leopard negative interaction.

Location:

The ongoing study is in Junnar Forest Division which is in north of Pune district of Maharashtra, having high human density and agriculture dominating landscape.

Methods:

We used ArcGIS as a tool to identify clusters of conflict hotspots (Optimized Hot Spot Analysis) and predicted probable conflict zones using 20 years of secondary data (Emerging Hotspot Analysis) using Getis-Ord Statistics. We conducted camera trap exercise in different blocks of 2 km^2 grid in 100 km^2 to estimate population and persistence of the leopard in the landscape. We also deployed 11 radio-collars (Vectronic-Iridium satellite collars) to understand the space use and movement ecology of the leopards in the landscape.

Results:

We found a surge in human-leopard negative interaction in the year 2014. We identified spatio-temporal clusters of conflict-hotspots in the division and predicted new hotspot categories area. We observed density of 6.75 leopard individuals/100 km^2, which is high in comparison with many protected areas. We observed an average home range of 40 km^2 (95% BBMM) which is less in comparison with other leopard ranging landscapes. The average daily movement is 3.99 km/ day. The average core area of collared leopards was 5.8 km^2 (50%, BBMM). The average speed at nighttime of the collared leopards was 0.25 km/hour and 0.05 km/hour during the day.

Conclusion:

The spatio-temporal conflict hotspot cluster and prediction are helping the department for more robust policy implications managing in mitigating negative interactions through site specific management implication. We observed small home-range, core area, daily movement, and high leopard density which is crucial in understanding leopard ecology in the landscape and to curb human-leopard negative interactions.

Mishmi Takin: Insights of a rare and least known bovid from Arunachal Pradesh

Gaurav PJ

Aim:
The Mishmi Takin (*Budorcas taxicolor taxicolor*), a charismatic and lesser-known member of the bovid family, thrives in the remote areas of the Indian eastern Himalayan region within Arunachal Pradesh. This study attempts to better understand this species by collecting more information on its distribution, and habitat preferences, through a combination of field surveys and social surveys looking at traditional knowledge of the indigenous communities.

Location:
The current study was carried out in selected parts of Arunachal Pradesh In Mishmi hills which mainly comprises subtropical and temperate forest of the eastern Himalayas.

Methodology:
Our study utilized a multifaceted approach with opportunistic camera trapping and comprehensive sign surveys to gather direct and indirect evidence of the Mishmi Takin's presence and key informative surveys to understand traditional knowledge about the species. We modelled the distribution of the species across the region by using the Maxent algorithm on the collected data.

Results and discussion:
The Maxent model resulted in delineation of high, moderate, and low potential areas for Mishmi Takin. We identified key factors contributing to the species' distribution. Distance to roads emerged as the most influential factor (29.8±1.54), followed by Distance to snow (28.4±2.0). Elevation (15.9±2.09), Forest type (12.2±1.04), and Terrain Ruggedness Index (10.3±1.75), all of which exhibited moderate contributions. NDVI only showed a minor influence (3.4±1.60), with distribution predicted in various forest types such as Sub-Himalayan light Alluvial Semi-evergreen forest, Eastern Alluvial Soil Semi-evergreen forest, *Terminalia-Dubunga* Forest, Subalpine Birch/Fir forest, and Birch/*Rhododendron* forest. Meanwhile, integrating our scientific studies and traditional knowledge acquired with key informative surveys has led us to identify congregation sites and ecology of the species and its habitat. We discuss the challenges, limitations and efforts put into the conservation of the species. Through the comprehensive baseline of information generated so far, we provide a glimpse into the species' biology and natural history.

Project Title:
An integrated approach for conservation of Mishmi Takin in Northeast India: Linking traditional ecological knowledge to species ecology.

Principal Investiga-tor(s):
Dr. Gopi G.V.
Dr. Bharat Bhatt,
Dr. S. Sathyakumar,
Dr. Parag Nigam, Dr. Bilal Habib

Researcher(s:
Gaurav PJ (Junior Research Fellow),
Sirumai Khushiyali Kri
(Project Assistant)

Funding Agency:
Ministry of Environment, Forest and Climate Change (MoEFCC)

Project Duration:
2019-Ongoing

Keywords:
NA

Twitter Handles:
@moefcc, @wii_india, @gopigv
@gaurav_pj

Tweet:
The Study provides baseline information on the natural history of this lesser-known bovid Mishmi Takin and explains how Integrating traditional knowledge has helped us to understand this species more in the Indian eastern Himalayas

Project Title:
Monitoring reintroduction Gaur (*Bos gaurus gaurus)* in Bandhavgarh Tiger Reserve, Madhya Pradesh, Phase II

Principal Investiga-tor(s):
Dr. Parag Nigam,
Dr. Bilal Habib,
Dr. Samrat Mondol

Researcher(s):
Ritesh Vishwakarma
(Senior Research Fellow),
Vijay Babu Nandwanshi
(Project Intern),
Raksha Bhati (Project Intern)

Funding Agency:
Madhya Pradesh Forest Department (MPFD)

Project Duration:
Three Years (2019-22)

Keywords:
Bovine- Reintroduction, Habitat- Restoration, population dynamics, recolonization, supplementation.

Twitter Handles:
@moefcc, @wii_india, @moefcc, @wii_india, @moefcc, @wii_india, @eventoed, @minforestmp, @paragnigam09, @wildwithwolves, @BandhavgarhTig2, @IUCN_WildCattle

Tweet:
Gaur's Resilient Return to Bandhavgarh Tiger Reserve. Learn how science-led initiatives safeguard the existence of a species. #ConservationSucess #WildlifeRestoration

Restoring the Wild: Gaur's resilient return to Bandhavgarh Tiger Reserve

Ritesh Vishwakarma

Background & Aims:
The gaur (*Bos gaurus*), the largest wild bovid, was once abundant in the Indian subcontinent; however, it faces severe threats, including habitat loss and poaching. Consequently, efforts were made to reintroduce gaur populations in the Bandhavgarh Tiger Reserve (BTR) in 2011-12 to counter local extinction and conserve the species. This study provides the current status of the reintroduced gaur population in BTR and its future conservation challenges.

Location:
The BTR is located on the northeastern border of Madhya Pradesh in the central Indian landscape.

Methods:
Between 2011-12, a total of 50 individuals (comprising 13 adult females, 21 sub-adult females, 02 juveniles, 11 sub-adult males, and 03 adult males) were reintroduced to BTR. The founder population was closely monitored through satellite telemetry, camera traps, line transects, and behavioural observations made between 2011 and 2022. During this period, ecological factors such as range exploration, genetic structure, competition with conspecifics, and habitat utilization have been also studied.

Results:
The gaur population in BTR increased steadily from n=50 to n=168 individuals in 2022. In 2022, the population mostly comprised 37 adult females, 43 calves, 22 sub-adult females, 30 juveniles, 15 sub-adult males, and 21 adult males. The estimated sex ratio showed a higher adult male to adult female ratio but a higher adult female to calf ratio. This population formed seven herds with mixed age and sex class individuals inhabiting over 470km^2 of the reserve. Additionally, wild elephant recolonization poses significant risks. The genetic study of gaur suggests increasing the genetic variability in the population is also necessary.

Conclusion:
This study underscores the importance of ongoing conservation efforts to ensure the long-term survival of the reintroduced gaur population and facilitate the species' successful recovery in the BTR. Habitat restoration, population supple-mentation, regular monitoring, and disease control measures are proposed solutions to address conservation challenges. The reintroduction has been successful, the study identified challenges for the long-term survival of gaur in BTR. Expanding ranges beyond the park, overlapping an area of 85 km^2 outside the PAs makes them vulnerable to interaction with livestock, resulting in disease transmission.

Tracking the Rain-bird: Satellite telemetry of Pied cuckoo (*Clamator jacobinus*) to understand the migration pattern

Debanjan Sarkar

Aim:
Brood parasites are primarily solitary migrants, but their ecology outside of their brief breeding season is mostly unknown. Pied cuckoo (*Clamator jacobinus*) is a brood-parasitic summer migrant bird and appears in monsoon season in Northern India. Despite the well-established ecological and evolutionary significance of the Pied cuckoo, only a limited amount of information exists on its migratory behaviour. The aim of the study was to understand the migration pattern of Pied cuckoo.

Location:
Two individuals of Pied cuckoo were tagged in July, 2020 from Dehradun, India.

Methodology:
We conducted Pied Cuckoo mist netting surveys from May 2019 and 2020, successfully capturing one on July 12th (Named: Megh) and another on July 14th (Named: Chatak), 2020. Pied cuckoos were captured using mist nets, call playback and a dummy (fiberglass replica). Captured individuals were tagged using 2gm Argos Platform Transmitter Terminal (PTT) tags to record its movement patterns.

Results and discussion:
Two individuals gave 319 and 117 location fixes. Majority of the locations were received in shrubland habitat type. Megh stopped responding after 23 days. Chatak covered 5000 km and reached the coast of Somalia in Africa via stopovers at Rajaji National Park, Uttarakhand, near Malvan coasts, Maharashtra, and Gokarna in Karnataka. This study provides the first empirical evidence that once the southeast monsoon recedes, Pied cuckoo migrates from India to Africa through the Arabian sea

Project Title:
Linking protected area network and near realtime locations of rainbird with IBIN

Principal Investiga-tor(s):
Dr. Gautam Talukdar,
Dr. R. Suresh Kumar

Researcher(s):
Debanjan Sarkar (Ph.D. Scholar)

Funding Agency:
Department of Biotechnology

Project Duration:
2018-2022

Keywords:
NA

Twitter Handles:
@moefcc, @wii_india, @moefcc, @wii_india, @imDebanjan, @sureshwii

Tweet:
Immense feat of migration by the "Rainbird" Pied cuckoo. Satellite PTT tagged Pied cuckoo at Dehradun, India, migrated 5000 km to reach the Somalia coast of Africa

Project Title:
Development of landscape management plan and monitoring with reference to Ken-Betwa River link project in Panna Tiger Reserve, Madhya Pradesh

Principal Investiga-tor(s):
Dr. Ramesh Krishnamurthy,
Dr. J.A. Johnson

Researcher(s):
Project Fellow

Funding Agency:
NWDA

Project Duration:
2018 – 2024

Ranging pattern through GPS tracking of resident and migratory vultures of Panna Tiger Reserve, Madhya Pradesh

Dibyendu Biswas

Aim:
Vultures are the most vulnerable functional group in the bird community worldwide, and over the past few decades, old world vultures in India have experienced a drastic decline for multiple reasons. So far, the major focus has been on conservation breeding and toxicological studies of vultures. Mitigation of conservation problems needs transboundary approach for the migratory vultures. This study focuses on the home ranges of both the resident and migratory vultures from central India.

Location:
This study has been carried out in the Greater Panna Landscape in Madhya Pradesh with a focus on the Panna Tiger Reserve (PTR).

Methods:
We captured 25 vultures, which include 13 Indian Vulture (*Gyps indicus*) and two Red-headed Vultures (*Sarcogyps calvus*), eight Himalayan Griffons (*Gyps himalayensis*), and two Eurasian Griffons (*Gyps fulvus*). We fitted them with eObs GPS tags with a teflon harness. Data frequency was set to five-minute intervals and was downloaded through the Movebank repository. The transmitted movement data were analysed to investigate the movement dynamics and estimate the home ranges (HR). For the migratory vultures, we estimated the wintering and breeding home ranges separately. We used 'autocorrelated kernel density estimation' (aKDE) and estimated95% utilisation density for home ranges.

Results:
The mean of daily average movement of resident vultures was found 132.10 km (SD = 84.70) and the mean of home range (95% aKDE) was found to be 16068.66 sq. km. (SD = 17783.57). For the migratory vultures we found that the breeding (242145 sq. km., SD = 159529.9) and wintering grounds (784628.3 sq.km, SD =557498.1), migration pathways, and the major stop-over sites spread over 10 countries.

Conclusion:
We conclude that the residential vultures in PTR are extensively using human-dominated landscapes. Their movement pattern incorporated in the local conservation measures, will yield more effective conservation outcomes.
The safeguarding of migratory vultures in India greatly depends on transboundary conservation diplomacy.

Key Words:
Telemetry, homerange, transboundary, conservation, landscape

Twitter Handles:
@moefcc, @wii_india, @moefcc, @wii_india, @Dibyendu_shubho, @kramesh95, @wii_india, @moefcc, @PannaTigerResrv

Tweet:
#VultureVoyage The whereabouts of the resident and migratory vultures of Panna Tiger Reserve #TelemetryStudy

Bird hazards to aircraft in Indian air fields

Dr. P. Pramod

A study on bird and wildlife hazards to aircrafts in Indian civil airfields has been initiated since 2020 under the MoU between the Airports Authority of India and Sálim Ali Centre for Ornithology and Natural History (SACON). The study aims to understand the intensity of bird and animal activity in the Indian civil airfields and provide the necessary support, guidance, and recommendations to specific airports to reduce hazards/conflict to aircraft. Currently, we are studying seven (Agartala, Bhopal, Calicut, Indore, Patna, Surat and Varanasi) international airports across the county. The study has two phases: first, an intensive study to assess the extent of the problem and suggest mitigatory measures, and the second phase, monitoring the implementation of recommendations and the response of the bird community. The study design includes a 10 km radius (in three encircles; 2km, 5km, and 10km) area around the runway wherein intensive data collection is done inside the airport closer to the runway, and the intensity reduces as it goes away from the runway. Data on bird and wildlife populations, vegetation, and time budget analysis of selected problematic species has been carried out using standard procedures. Mapping of landuse/landcover and bird attractant elements within 10 km radius of the airport was also done. Information on bird strike, animal movements, and flight movements were collected from the records of the airport authority. Analysis of data was carried out with the help of available software. Based on the results of species occurrence, relative abundances and season wise activity patterns, airport-specific recommendations were given to the management (please specify recommendations) . We also conducted training and capacity-building programs for bird identification for the members of Bird Hazard Compact Team (BHCT). The monitoring of the implementation of recommendations and its response on bird/wildlife communities are ongoing.

Project Title:
A Study on bird/wlidlife hazards in select Indian civil airfields

Principal Investiga-tor(s):
Dr. P. Pramod
Dr. P V Karunakaran

Researcher(s):
Anoop Raj P. N (SRB),
Ashiq PP (JRB),
Arjun S (JRB)

Funding Agency:
Airports Authority of India

Project Duration:
3 years in each airport

Key Words:
Bird strike mitigation, aviation safety, habitat management

Twitter Handles:
NA

Tweet:
NA

Project Title:
Black Kite Project

Principal Investiga-tor(s):
Dr. Nishant Kumar,
Qamar Qureshi,
Dr.YV Jhala

Researcher(s):
NA

Funding Agency:
Raptor Research & Conservation Foundation, Mumbai &
DBT/Wellcome Trust UK India Alliance

Project Duration:
2012-Ongoing

Key Words:
Food security; poultry production and distribution network; ethno-ornithology; ecosystem service; zoonoses

Twitter Handles:
@moefcc, @wii_india, @_nishantk, @pawsweb, @delhikites

Tweet:
Ghazipur processes >100,000 fowls daily, yielding 27,375 tonnes of poultry waste. This draws huge flocks of Black-eared kites, scavengers migrating between Central & South Asia. >33,600 kites/day feed on poultry detritus from Oct-April

Ecological impacts of poultry waste on urban raptors: Conflicts, diseases, and climate change implications amidst pandemic threats

Dr. Nishant Kumar

Aim & Location:

The dramatic increase in poultry production and consumption (PPC) over the past decades has raised questions about its impacts on biodiversity, particularly in the Global South. This study focuses on the ecological and environmental impacts of PPC waste metabolism at Asia's largest livestock wet market, located next to the continent's largest landfill of Ghazipur in Delhi, which I have been monitoring since 2012

Methods & Results:

The daily processing of >100,000 poultry-fowls at Ghazipur results in an annual production of ~27,375 metric tonnes of poultry-waste, attracting massive flocks of Black-eared kites, migratory facultative scavengers that winter in South Asia. Approximately >33,600 kites forage in the area every day and disposed 8.83% of the total PPC slaughter-remains produced every winter during October-April. However, with their return migration to Central Asia, kite flocks over Ghazipur reduced by 90%, leading to a proportional decrease in scavenging services, leading to rotting biomass on landfill. Absence of kites from the larger, migratory race during May-September did not elicit any compensatory response from the small Indian kite, whose numbers over landfill remained unchanged. This raises vital questions about pollution/nuisance and microclimate impacts by greenhouse gases released from massive amounts of routine detritus. Other opportunistic scavengers, e.g., dogs, rats, cattle-egrets, several passerines, and animal-farms (fishes and pigs) also benefited from PPC waste. Bearing in mind the prevalence of ritual feeding of meat chunks to kites in Delhi, my research indicates how life-history traits (migratory vs. resident) enable exploitation of specific anthropogenic resources, creating distinct niches for each kite subspecies.

Public health and ethical concerns, including Avian-influenza outbreaks in 2018-21 and pandemic-lockdowns from 2020-22 that affected informal meat processing reduced the flocking of kites and behaviour of other commensals at Ghazipur by altering spatial dispersion of PPC remains.

Synthesis and applications:

Waste-biomass driven cross species associations can exacerbate physical conflicts/injuries/accidents (e.g., aerospace conflicts) and zoonotic threats and by putting humans and animals in close contact. The quantity, type, dispersion, and accessibility of food waste for opportunistic urban fauna in tropical cities along avian migratory pathways are crucial to threats to public health, and vital for the conservation of migratory avian-scavengers like Eurasian Griffons and Steppe Eagles that are facing extinction threats. Impacts of waste based biomass on opportunistic scavengers warrants ecologically informed integrated management of city detritus.

Underwater soundscape: Acoustic response of Ganges river dolphin in noisy environment

Gargi Roy Chowdhury

Aim:
This study investigates whether Ganges dolphins change their echolocation click in response to human induced changes in the riverscape.

Location:
The research was conducted in the highly human-dominated river Hooghly of West Bengal. It is characterized by frequent boat traffic, regular dredging to maintain certain depth, and modification of channel type such as creating canals to facilitate navigation. There is also natural tide-induced variation in the soundscape of the river.

Methods:
We employed passive acoustic monitoring devices (hydrophones) to study the echolocation clicks of dolphins. The devices were placed at regular intervals for 24-72 hours focusing on channel type, depth, and disturbance. A camera trap was set up in the nearest bank facing the acoustic monitoring device to record boat passage. Sound files were analyzed using PAMGuide software to calculate the mean sound level across various locations. A generalized linear Mix model was performed to understand which variables contribute to changes in frequency, inter click interval, and other acoustic parameters.

Results:
Our finding suggests that the ambient soundscapes in the habitat of the Ganges dolphin vary due to both natural and anthropogenic causes. Multiple boats operating at the same time increases the ambient soundscape significantly. Depth and channel types along with boat traffic explain the variation in frequency and inter-click interval of echolocation clicks. Temporal overlap with boat movement was restricted.

Conclusion:
This study sheds light on how Ganges dolphins respond to their dynamic environment. Restricted channel like canal intensifies the noise leading to lower presence and shift in echolocation click.

Project Title:
CAMPA DOLPHIN- Development of conservation action plan for Ganges river dolphin

Principal Investigator(s):
Qamar Qureshi,
Dr. Vishnupriya Kolipakam

Researcher(s):
Gargi Roy Chowdhury
(Project Fellow)

Funding Agency:
CAMPA

Project Duration:
2016-2025

Keywords:
Ganges dolphin, echolocation, river dynamics, human disturbance, altering soundscapes

Twitter Handles:
@moefcc, @wii_india, @V_kolipakam

Tweet:
Underwater soundscape in #Hooghly River #acoustic chaos #GangeticRiverDolphins

Project Title:
Long term monitoring of tigers, co predators and prey in tiger reserves and other tiger bearing areas of Vidarbha, Maharashtra.

Principal Investigator(s):
Dr. Bilal Habib,
Dr. Parag Nigam,
Smt. Jayoti Banerjee,
Dr. Jitendra Ramgaokar
Smt. Sreelakshmi Annabathula

Researcher(s):
Akshayi A S
(Senior Project Associate)

Funding Agency:
Maharashtra Forest Department, Govt. of Maharashtra

Project Duration:
2019 - 2029

Keywords:
Machine learning, connectivity analysis, hyperparameter optimisation

Twitter Handles:
@moefcc, @wii_india, @moefcc, @wii_india, @bhlab_india, @wildwithwolves, @akshayi_96, @shaheerkhan

Tweet:
Unlocking Networks: Harnessing ML for Connectivity! The Trek where ML aggrandize conservation efforts through connectivity. Together, we can protect wildlife habitats like never before! #MachineLearning #WildlifeConservation #ConnectivityAnalysis

Can data-driven machine learning approach aggrandize the connectivity analysis: An avenue to tiger connectivity in eastern Vidarbha Landscape

Akshayi AS

Aim:
Conserving biodiversity requires both the effective management of wildlife populations and a comprehensive understanding of the intricate interactions between wildlife and ecological components. Incorporating data driven approach in combination with ecological field data collection could help to derive the hidden insights from complex interactions. Thus, we aimed to perform connectivity analysis using Machine Learning (ML) models to generate connectivity map for tigers.

Location:
The study was conducted in Eastern Vidarbha Landscape (EVL), Maharashtra, a crucial area for promoting gene flow across central and southern India, vital for the tiger population.

Methodology:
We used tiger presence data obtained from extensive camera trapping exercise in EVL as target and four Machine Learning algorithms viz k Nearest Neighbour (KNN), Extreme Gradient Boosting (XGB), Random Forest (RF) and Naïve Bayes (NB) classifiers, employed on twelve geospatial parameters influencing tiger suitability to derive probability prediction mapping. The connectivity current maps generated using circuitscape model, were selected based on ROC and confusion matrices of ML models.

Results:
KNN and NB classifier models surpassed others with 91% and 92.6% accuracy after hyperparameter optimisation. Moreover, the current flow paths from all the four ML model outputs on circuitscape model were similar and distinct to highlights the constrained path and corridors precisely. The feature importance graphs of ensembles - XGB and RF tried to bring a finer insight on species environment relationship. While comparing with the available connectivity map, this study showed a 39% gain in high connectivity areas and 11% loss in low connectivity areas in EVL of Central India.

Conclusion:
We concluded that the ML model outputs were more flexible to run with the circuitscape to give a precise, finer, detailed, and reliable connectivity current map. We anticipate that this approach can be inferred to connectivity mapping of other species as well as in heterogenous and complex ecological terrain. This study highlighted the potential of ML models to aggrandize or augment the connectivity analysis by incorporating the prediction probability output with circuitscape model.

Density estimation of ungulates using a robust method of population estimation in a semi-evergreen tropical rain-forest of North-east India

Surojit Moitra

Aim:
Monitoring ungulate populations is crucial, as they play a vital role in various ecological processes and constitute the major prey base for carnivores. Indirect indices of herbivore abundance may not provide robust results required for monitoring trends in abundance over time which is necessary to build a successful conservation effort. While commonly used methods like line transect sampling works well in open forests, it may not be efficient to carry out in challenging terrain. Thus, our study aims to provide a reliable density estimate of ungulates in an easily executable method suitable for rugged terrain accompanying dense vegetation.

Location:
The study was carried out between February 2021 to April 2022 in Pakke Tiger Reserve, Arunachal Pradesh, India. The core area of the tiger reserve is spread over 861.95 km^2. The terrain of the tiger reserve is very undulating and hilly and the altitude ranges from 122 m to over 2000 m above sea level. During this study, the low-land forest as well as a part of the high-altitude zone of the Pakke Tiger Reserve was studied using camera traps.

Methods:
The study area was partitioned into grids of 1 km^2, with a centroid generated for each grid. Camera trap-based distance sampling approach was followed for density estimation of ungulates. A single infrared camera trap was installed at the centroid of each grid. 234 days of active camera trapping was conducted using 79 camera traps and a total area of 1014 km^2 was sampled. Distance estimation of animals from captured images was carried out using ImageJ and Animetre software. Collected data was used to study the activity pattern and spatio- temporal interaction among the ungulate species.

Results:
A total effort of 39854495 possible photo capture events was used for abundance estimation and the overall density of ungulates was obtained to be 10.19 km^2. Sambar was found to be the most abundant ungulate, with a density estimate of 6.85 ± 1.59 km^2 followed by barking deer having a density of 2.52 ± 0.79 km^2. Density estimation of Himalayan Serow, Himalayan Goral and Hog Deer was not carried out due to insufficient image captures.

Conclusions:
The study demonstrates that camera trap-based distance sampling provides a robust estimation of animal density while also being a convenient method to carry out in challenging conditions, including undulating terrain, dense understory and ground vegetation often seen in forests of North-east India.

Project Title:
Securing habitats for threatened mountain ungulates through robust population assessment and conservation planning

Principal Investigator(s):
Dr. Vishnupriya Kolipakam,
Qamar Qureshi,
Dr. S. Sathyakumar,
Dr. Sutirtha Dutta,
Dr. Lallianpuii Kawlni,
Dr. Amit Kumar

Researcher(s):
Surojit Moitr (Project Associate-1),
Himanshu Matta, Tarun Singh

Funding Agency:
Ministry of Environment, Forest and Climate Change (MoEFCC)

Project Duration:
3 Years

Key Words:
Camera traps, distance sampling, ungulates

Twitter Handles:
@moefcc, @wii_india,
@moefcc, @wii_india,
@V_Kolipakam

Tweet:
NA

Project Title:
Biogeography of eastern borderland in India: Evidence from ectotherms

Principal Investigator(s):
Dr. Abhijit Das

Researcher(s):
Bitupan Boruah
(Senior Research Fellow)

Funding Agency:
SERB, Govt. of India

Project Duration:
4 years

Integrative taxonomic approach in delineating cryptic herpetofaunal diversity of Northeast India

Bitupan Boruah

Aim:
Employing an integrative taxonomic approach, our study aimed to delineate cryptic diversity in herpetofauna through a combination of morphological, osteological, behavioural, and molecular data.

Location:
We conducted the present study in Northeast India (NEI), which is a part of two globally recognized biodiversity hotspots - eastern Himalaya and Indo-Malayan hotspot. Although the region often regarded as a treasure trove of herpetofauna, diversity of the region is very likely grossly underestimated.

Methods:
We conducted the study during 2019–2023 across 30 localities including 20 protected areas and spanning an elevation range of 30–3000 m asl. Field sampling was done using visual encounter surveys during both night and day time. Morphological characters of the collected specimens were studied under a stereo microscope and measurements were taken using a digital calliper. To understand evolutionary relationships, we conducted molecular phylogenetic analysis of mitochondrial and nuclear genes, using Maximum Likelihood and Bayesian approaches. Additionally, real-time acoustics recordings of anurans were obtained using sound recorders and unidirectional microphone, and subsequently visualized and analysed in Raven Pro software.

Results:
We found that Natricine snakes originated in Asia (India+ Sri Lanka) 30 My ago and then dispersed out of Asia. Our biogeographic analysis shows that Brahmaputra valley is a major barrier for Agamid lizards (*Calotes*) and arboreal snakes (*Boiga*). This barrier effect was also observed in Southeast Asian anuran groups (*Micryletta and Limnonectes*) and Natricine snakes (*Smithophis*), where Brahmaputra valley marked their northwestern distribution limit. The "filter" effect of the barrier is rather shown by our phylogenetic study involving Natricine snake (*Rhabdophis*). This study also unveiled a new genus and eight new species of herpetofauna including three anurans and five reptiles from NEI and rediscovered two lost species of snake from Brahmaputra valley.

Conclusion:
The present study shows the barrier effect of Brahmaputra river in NEI and delineate previously underexplored cryptic diversity using integrative approach. The study envisages further relook into the biogeography of NEI.

Key Words:
Biodiversity hotspot, morphology, new species, phylogeny, taxonomy.

Twitter Handles:
@moefcc, @wii_india, @moefcc, @wii_india, @Bitupan81035978

Tweet:
The present study deals with understanding the role of geographic barriers in Eastern Borderland of India using herpetofauna as model. Further, the study delineates cryptic herpetofaunal diversity using integrative approach.

Assessing dolphin oil bait fishing in Assam: A scientific inquiry

Dr. Sunny Deori

Aim:
Direct killing and habitat reduction are major factors contributing to the declining Ganges dolphin population in India. The practice of dolphin oil bait fishing, mainly conducted by the Bin community fishermen, poses a significant threat to local dolphin populations. This research aims to assess the extent and prevalence of dolphin oil bait fishing in Assam, particularly within the Brahmaputra river system, a critical habitat for Ganges river dolphins.

Location:
The study was conducted within the Brahmaputra river system in Assam, encompassing various villages and fishing areas used by the Bin fishing community.

Methods:
Notably, Dhuburi district in Assam has a significant Bin community presence. We used a snowball sampling approach to identify all dolphin oil bait fishermen and their fishing locations for in-depth open-ended questionnaire surveys.

Results:
Our inquiry found 146 fishermen exclusively involved in dolphin oil bait fishing, with 133 agreeing to interviews. Among them, 99 confessed to using dolphin oil to bait a catfish called Neriya (*Clupisoma garua*). Each fisherman was estimated to use an average of 21.04 (+17.44) ml per day, resulting in an annual demand for dolphin oil in Assam ranging from 467.28 to 1163.62 liters, equivalent to the oil of 10-25 adult dolphins.

Conclusion:
Given that Ganges dolphins have a low reproductive rate, with calves born every 3 to 6 years and a 12-month gestation period, it's clear that human-induced pressures are driving a population decline beyond their natural recovery capacity. To address this issue, we recommend an immediate ban on dolphin oil bait fishing in Assam, in light of the increasing use of dolphin oil in Neria fishing and the growing number of oil bait fishermen, including the younger generation. Rigorous monitoring and oversight by relevant authorities are essential. Additionally, providing alternative livelihood opportunities for these fishermen is crucial, with government agencies extending support through ongoing welfare programs to aid their families.

Project Title:
Development of conservation action plan for River Dolphins (*Platanista gangetica gangetica*)

Principal Investigator(s):
Qamar Qureshi,
Dr. Vishnupriya Kolipakam

Researcher(s):
Dr. Sunny Deori
(Project Associate),
Dr. Abdul Wakid (Project Scientist)

Funding Agency:
CAMPA

Project Duration:
2016- 2025

Keywords:
Ganges river dolphin, Brahmaputra, Bin community, dolphin oil, dolphin conservation

Twitter Handles:
@moefcc, @wii_india, NA

Tweet:
NA

Project Title:
Population management of species involved in human wildlife conflict

Principal Investigator(s):
Qamar Qureshi,
Dr. Lallianpuii Kawlni,
Dr.Vishnupriya Kolipakam,
Dr. Kafil Hussain

Researcher(s):
Uddalak Tathagato Bindhani (Project Fellow & PhD student),
Dr. Sanath Krishna Muliya (Project Scientist),
Deepika Boora (PhD student),
Dr. Priya Gusain (Project Scientist)

Funding Agency:
Ministry of Environment, Forest and Climate Change, Govt. of India

Project Duration:
2018-2023

The Simian amidst Sapiens: Ranging patterns and movement strategy of the synanthropic Rhesus macaque (*Macaca mulatta*) in a mosaic landscape in northern India.

Uddalak Bindhani

Aim:
Macaca mulatta inhabit a wide range of natural and anthropogenic landscapes. Ranging patterns in synanthropic macaques are influenced by habitat preference, which may indicate spatial resource distribution and localized human-macaque conflict.

Location:
Mosaic habitat of 16 km^2 in suburban Dehradun city, Uttarakhand, India.

Methods:
Two socially distinct, similar sized synanthropic rhesus troops (A and B), both foraging on natural and anthropogenic food resources, were studied. An adult female from each troop was collared with a GPS logger and fixes were collected at 15-minute intervals during summer (April-June) and monsoon (July-August) of 2022. Overall and seasonal ranging patterns were determined and compared. Habitat selection ratios and site fidelity were deduced. Movement strategy of the macaques were examined based on their overall and seasonal step length distributions.

Results:
Overall home range (95%) and core range (50%) of troop A was 0.26 km^2 and 0.04 km^2 respectively; and B was 0.47km^2 and 0.08 km^2, kernel density estimation with least squares cross-validation. Mean daily travel distances were ~8.6 times of mean daily displacements. Habitat selection ratios showed high preference for roadsides and human habitation (Log-likelihood, alpha=0.05). Mean roost revisits showed high site fidelity; 6.27 ± 0.32 (n=118) for A and 5.03 ± 0.37 (n=92) for B. Distributions for consecutive step lengths were long-tailed, exhibiting patterns for short intensive searches with long directed movements in both troops (monsoon: log-normal; summer: power-law) [n=4477(A); 3683(B); Kolmogorov-Smirnov, alpha=0.1].

Conclusions:
High preference for anthropogenic sites and prevalent site fidelity along habitat edges highlight recurrent movement to provision sites (dumpsites, houses) and return to preferred refuges. This non-Brownian movement with frequent revisits may perpetuate heightened perceived agonistic interactions in humans influencing long-term human-macaque coexistence. Travel between clumped forage patches as well as dispersed resting sites in a human-modified landscape dictates overall movement strategy in urban macaques.

Keywords:
Human-macaque conflict, human-macaque coexistence, GPS collar, non-Brownian movement strategy, commensal.

Twitter Handles:
@moefcc, @wii_india, @utb_xiii , @muliya_sanath , @lalanikawlni , @kafilhussain , @V_kolipakam

Tweet:
Investigating #movement and #habitatuse of #commensal #RhesusMacaques via #GPStelemetry shall lead to scientifically sound #conflict #management practices being implemented to ensure long-term human-macaque #coexistence.

eDNA as a biodiversity monitoring tool

Bhawana Pant
Dr. Vishnupriya Kolipakam, Sneha Shivaji Mane, Kristy Deiner, Qamar Qureshi

Aim:
India's major river systems, such as the Ganges and Brahmaputra, possess highly fertile basins. However, due to their extensive lengths, documenting the vast biodiversity within these rivers presents a significant challenge. Environmental DNA (eDNA) technology offers a non-invasive method for detecting rare species and quantifying species diversity. Nevertheless, Indian rivers are characterized by high turbidity and substantial contamination from domestic and industrial sewage, making DNA extraction a formidable task.

Location:
The study was conducted in the Kulsi River, Assam a tributary of the Brahmaputra River.

Methods:
To optimize the eDNA metabarcoding technique in Indian river systems, we collected water samples from the Kulsi River in Assam, a tributary of the Brahmaputra. We processed them using MF-Millipore TM Mixed Cellulose Esters (MCE) Membrane Filters (Merck), with a pore size of 0.45 µm. We employed metabarcoding targeting genes like COI, vertebrate 16S, and 12S rRNA to capture species diversity comprehensively.

Results:
Our study unveiled six fish and 22 planktonic families, with seven families exhibiting notable prevalence. Furthermore, eDNA analysis successfully identified mammalian species from 16 significant families. Importantly, eDNA monitoring proved valuable in assessing plankton diversity, a critical component of the local fish diet and the broader ecosystem. Remarkably, 4% of the sequences were attributed to the Platinistidae family, given our estimate of approximately 12 dolphins inhabiting the Kulsi River based on river surveys.

Conclusion:
The finding underscores the robustness of the eDNA technique, establishing it as a reliable tool for monitoring purposes. This study highlights how advancements in eDNA technology and expertise contribute to a more profound understanding of ecosystem processes and inform conservation and biodiversity management practices.

Project Title:
Development of conservation action plan for Ganges river Dolphins (*Platanista gangetica gangetica*)

Principal Investigator(s):
Qamar Qureshi,
Dr. Vishnupriya Kolipakam

Researcher(s):
Bhawana Pant (Research Biologist),
Sneha Shivaji Mane
(Project Associate-I)

Funding Agency:
CAMPA

Project Duration:
2016-2025

Keywords:
Metabarcoding, fish, dolphins, river systems, biodiversity assessment.

Twitter Handles:
@moefcc, @wii_india, @moefcc, @wii_india, @CAMPA_Dolphin, @V_kolipakam, @vrtiwari1, @SSnehamane01, @Bhawana9857735

Tweet:
Exciting eDNA Study Alert! eDNA tech is revolutionizing biodiversity monitoring in India's rivers. From rare fish to playful dolphins, this study dives deep into our ecosystem's secrets!#eDNA #BiodiversityMonitoring

Project Title:
Recovery of dugongs and their habitats in India: An integrated participatory approach.

Principal Investigator(s):
Dr. J. A. Johnson,
Dr. Nehru Prabakaran

Researcher(s):
Sagar Rajpurkar (Project Fellow)

Funding Agency:
CAMPA

Project Duration:
2016-2025

From Pixels to Conservation: Automating dugong and other marine mega-fauna detection through artificial intelligence and machine learning

Sagar Rajpurkar

Aim:
Unmanned Aerial Vehicle (UAV) are increasingly becoming an effective tool to study and monitor wildlife in remote locations. In the Andaman and Nicobar Islands, we used UAVs to successfully detect dugongs and other marine-megafauna. The present study aimed to automate the process of marine megafauna detection through artificial intelligence (AI) and machine learning.

Location:
The aerial surveys were undertaken in critical dugong habitats in Andaman and Nicobar Islands.

Methods:
The videos and HD images of the detected marine megafauna, viz. Dugongs, Spotted Eagle Rays, Manta Rays, Dolphins, Zebra sharks and Sea turtles, were used to create an automated model for marine species detection and identification with high accuracy. Training and validation dataset of a 80-20 split, comprising of 25,590 frames and 31 HD images was used to train and create the AI based model. Frame-skip and d-hashing techniques were used for dataset trimming for elimination of similar images, which yielded 814 distinct images. These images were marked for training and validation, comprising 1128 objects, which were annotated using polygon and box annotation tools. The model was run using Amazon Web Services using YOLO-v5 artificial neural network and deep learning architecture with 100 epochs. The accuracy, F1 score and precision were calculated for all the species from the videos of the test dataset.

Results:
The precision and recall of the training and validation dataset was 0.90 and 0.97 respectively for the created model. The test dataset had absolute precision, recall and F1 scores of 1.0 for zebra sharks, dugongs, eagle rays and manta rays. The precision, recall and F1 scores for dolphins were 0.97, 0.97 and 0.97 and for turtles was 0.9, 0.5 and 0.32 respectively from a total of 6450 test images. This showed the model created is accurate with high precision and recall scores.

Conclusion:
The present model is accurate to detect and track multiple globally threatened species that occur in Indian waters. The model can ease instant and on the go identification of multiple species, further proving the effectiveness of AI and deep learning approach.

Keywords:
Neural networks, dugongs, YOLO-V5, UAVs, prediction modelling, deep vision

Twitter Handles:
@moefcc, @wii_india, @RajpurkarSagar, @glenbhermon, @OishineeC, @nehrutp, @ksivakumarwii, @jajohny2013 @CAMPAdugong_WII

Tweet:
From Pixels to Conservation: Automating Dugong and other globally threatened Marine Mega-fauna Detection through Artificial Intelligence and Machine Learning

Occupancy and nest site selection of endangered Nilgiri Laughing thrush *Montecincla cachinnans* in the southern Western Ghats

Sujin. N. S

Aim:
The endangered Nilgiri Laughingthrush (NLT) inhabits high-elevation areas (>1400 meters) of the southern Western Ghats. This stretch has the largest extent of high-elevation forests, but almost 50% of it has been converted to raise commercial and economic crops during colonial periods. Therefore, understanding the factors that influence the occupancy and nest site selection of this threatened species could help in its conservation. Such studies can also help managers and policy decision-makers to initiate on-the-ground conservation activities.

Location:
High elevation zones (>1400 m) between south of Chaliyar River and north of Palghat gap in the Western Ghats.

Methods:
We developed a single-season single-species occupancy model using spatial replicates over 290 grids of 4 km^2 size. In each grid, we conducted a maximum of four 500 m transects to record the presence or absence of the species, sampling covariates, and site covariates. We used the R package Unmarked to derive occupancy estimates and perform model averaging. Nest site selection was assessed at two scales, site & patch, by comparing the characteristics of nests to those of random locations.

Results:
NLT occupied 148 out of 290 grids, with a naïve occupancy estimate of 0.51. The number of observers influenced the p, so for all subsequent models, p was modelled as a function of the number of observers. Model averaged occupancy estimates showed that elevation, canopy, and herbaceous cover positively influenced the NLT, while invasive species cover and tree height negatively influenced it. The estimated p and Ψ were 0.48 and 0.558, respectively. We recorded 35 nests, most of which were built on bamboo. Nest success was low. At patch scale, canopy cover influenced positively the nest site selection, while litter depth and canopy cover influenced at site scale.

Conclusion:
Our results indicate that the species occupied grids with stunted trees, thick canopies, substantial herbaceous cover, and minimal invasive species cover, particularly in higher elevations. This suggests that the species is a specialist of shola grassland and avoids invasive species-dominated areas.

Project Title:
Ecological assessment of endemic and threatened Laughing thrushes of Western Ghats to develop conservation plan for securing their population and habitats

Principal Investigator(s):
Dr. S. Babu
Dr. R. Jayapal
Director, AIWC
Mr. Anoop

Researcher(s):
Mr. Sujin. N. S.

Funding Agency:
Ministry of Environment, Forest and Climate Change

Project Duration:
4.5 year

Keywords:
Endemic birds, understory, Nilgiris, invasive plants, herbaceous cover

Twitter Handles:
NA

Tweet:
NA

Project Title:
Smooth-coated Otter as an ecological indicator of riparian habitat ecosystem

Principal Investigator(s):
Dr. Riddhika Ramesh

Researcher(s):
Mr. Ankit (Junior Research Fellow)

Funding Agency:
Science & Engineering Research Board, Department of Science & Technology

Project Duration:
2 years

Keywords:
Semi-aquatic mammal, riparian habitat quality, ecological indicator, Western Ghats, niche dynamics

Twitter Handles:
NA

Tweet:
Spatio-temporal dynamics in habitat ecology of Smooth-coated Otter

Spatio-temporal habitat ecology of Smooth-coated Otter in the Bhavani-Noyyal River basin, Tamil Nadu

Ankit Moun

Aim:
Environmental changes driven by anthropogenic activities lead to degradation of riparian habitats/ecosystems. Otters are flagship freshwater obligates and can act as important ecological indicators. We assessed the riverine and riparian habitat quality along otter distribution sites and mapped the seasonal habitat suitability.

Location:
The Coimbatore Forest Division comprises of 7 forest ranges with 8 rivers viz. , Bhavani, Kolikarai, Neeradi, Siruvani, Kodungarapallam, Noyyal, Coonoor and Mulli.

Methods:
We characterized the riverine and riparian habitats from environmental data using artificial neural networks and self-organizing maps (SOM) and compared Smooth-coated otter (SCO) sign encounter rates with clusters of habitat characteristics. We assessed the seasonal habitat use and suitability of SCO using stepwise ordinary least-square regressions and species distribution models, respectively.

Results:
The SOM revealed six habitat clusters in both seasons. Clusters representing higher stream orders had moderate to high encounter rates of SCO; while the streams outside reserve forest had minimum or no SCO evidence. In both seasons, SCO sign encounter rates increased with riparian quality index, barren land, emergent shoreline vegetation and in streams with less human disturbance. Encounter rates decreased in stream segments with high chloride and ammonia concentrations, and at sites with artificial structures and high grass cover. Streams with dry deciduous and degraded forests along the buffer edge had high encounter rates in the dry season. Sign encounter rates increased in stream segments buffered with plantations, and with sandbanks, pools, and turbulent stream flow near confluences in the wet season. SCO habitat suitability varied in the dry (0.01-0.61) and wet-season (0.02-0.71). The increase in habitat suitability in the wet season was recorded at river confluence junctions. Although the niche models predicted few moderate to highly suitable (0.25-1) streams outside the reserve forest, the majority of suitable sites were predicted inside the reserve forest. Compared to the dry season, habitat suitability was six times higher in the wet season in the higher order streams.

Conclusion:
Our study demonstrates the novel application of machine learning approaches to characterize otter habitat and confirms that fine-scale regional environmental changes and riverine flow across seasons are driving spatio-temporal shifts in SCO habitat use and suitability.

Unveiling the effects of elevation and disturbance through intermediate disturbance hypothesis: A case study of vegetation patterns from Churdhar Wildlife Sanctuary, Himachal Pradesh

Priyanka Sharma

Aim:
Research focused on disentangling the impacts of biotic and abiotic factors together on vegetation in Western Himalaya is limited, and only a very small number of studies have explored these patterns in relation to intermediate disturbance hypothesis in this region. The study was conducted to examine the factors influencing vegetation patterns and understand how these patterns varies across the gradients of elevation and disturbance while critically evaluating the applicability of intermediate disturbance hypothesis.

Location:
The study was conducted in Churdhar Wildlife Sanctuary, situated in the southern part of Himachal Pradesh.

Methods:
A total of 230 sites were randomly selected along the elevation gradient. Ten quadrats (10×10m) were laid randomly to sample the trees and within each quadrat nested quadrat (5×5m) was laid for shrubs. Data on species composition, environmental variables (elevation, slope, aspect, solar irradiation, temperature seasonality, topographic ruggedness index, topographic wetness index) and disturbance were measured in each quadrat. The data was subjected to TWINSPAN analysis to classify vegetation into distinct plant communities. Generalized Additive Models (GAMs) were employed to model the response curves of structural attributes and diversity indices of vegetation to selected predictor variables.

Results:
Seven distinct plant communities were identified. The best generalized additive models yielded varying results, explaining 82.6%, 72.3%, 66.9% and 47.5% deviance, respectively for total basal area, tree density, tree species richness and tree diversity, while 40.8% and 43.3% deviance, respectively for shrub richness and shrub diversity. The predictive models suggested that the elevation, temperature seasonality, solar irradiation and disturbance exhibited significant effects ($p<0.05$). Except for total basal area, all the diversity indices along the elevation gradient showed multimodal patterns, while all the vegetation attributes and diversity metrics deviated from the anticipated unimodal "hump" shaped pattern as predicted by the intermediate disturbance hypothesis.

Conclusion:
The findings of the study highlight the intricate relationship of elevation and disturbance with vegetation, challenging the widespread assumption that unimodal peaked patterns are universally applicable.

Project Title:
Basic study design of biodiversity assessment for Himachal Pradesh

Principal Investigator(s):
Dr. Salvador Lyngdoh
Dr. B.S. Adhikari

Researcher(s):
Priyanka Sharma
(Project Biologist)

Funding Agency:
Japan International Cooperation Agency

Project Duration:
January 2021 - October 2023

Keywords:
Species diversity, Himalaya, altitudinal variation, anthropogenic, energy

Twitter Handles:
@moefcc, @wii_india, @Priyanka25201285, @Himalayanwolf1, @BS_ADHIKARI

Tweet:
This study focuses on understanding how elevation and disturbance affect the vegetation in a protected area of Himachal Pradesh. Find out if the intermediate disturbance hypothesis holds true! #Himalaya #VegetationEcology #Biodiversity Research

Project Title:
PAN India Assessment and monitoring of endangered species covered under the Integrated Development of Wildlife Habitats (IDWH) Scheme of MoEF&CC River Terrapin – Batagur baska

Principal Investigator(s):
Dr. Abhijit Das

Researcher(s):
Amirtha Balan R.
(Project Associate - I)
Vishwadeep Rout
(Project Associate - I)
Asim Bashir
(Project Assisstant)

Funding Agency:
MoEFCC

Project Duration:
1 Years

Critically endangered river terrapin *Batagur baska*

Amirtha Balan R.

Aim:

Access the current status of Critically endangered *Batagur baska,*
developing a long-term monitoring protocol for population and their habitat
Establishment of molecular detection method for *Batagur baska* in Sundarbans

Location:

The study was carried out in Indian parts of Sundarbans covering an area of about 3,483 sq.km of which 1,700 sq.km consists of rivers, canal, and creeks.

Methods:

We carried out boat-based visual encounter survey during February 2023. Questionnaire survey was carried out among the local fisherman from March to April and June to July in the northern Sundarbans covering six islands viz, Gosaba, Balli, Satjelia, Choto mulla khali, Kumirmari, Lot no. 124. A unique grid-based sampling was conducted, with grid size of 2 km x 2 km and extending up to 80 km from the coastline to the river. We also collected tissue samples of captive individuals from the forest department *Batagur* camps for sequencing mitogenome and for evolutionary studies. Water samples were collected in Nalgene bottles from 80 ponds in four islands viz. Gosaba, Balli, Choto mulla khali, Satjelia. Water was filtered using Nitrocellulose membrane and the membrane was preserved in ATL buffer for eDNA extraction.

Results:

Out of 12 islands bordering the protected area 6 islands were surveyed. Mapped the historic presence location of *Batagur baska*. No direct Sighting of *Batagur baska* from the boat based visual encounter survey, it covered 960 km river stretch of eastern Sundarbans in 21 days. The Questionnaire survey revealed 3 sightings out of 422 survey attempts to trace river terrapin in the wilderness. DNA extraction and sequencing is under process.

Conclusion:

The study proposes to use the modern molecular technique of eDNA to trace the presence of *Batagur* DNA in the environment so as to complement the species conservation in the wild. In the past few decades, the sightings of *Batagur baska* has decreased significantly, more studies should be carried out at the potential nesting sites.

Key Words:
Herpetofauna, river terrapin, Sundarbans, eDNA, mangroove.

Twitter Handles:
@moefcc, @wii_india, @moefcc, @wii_india, @DhaarunDina

Tweet:
This study focuses on the accessment of critically endangered *Batagur baska* with modern molecular technique eDNA from Sundarbans, West Bengal, India. #herpetofauna #batagurbaska #riverterrapin #conservation #sundarbans #estuarineturtle

A life, less ordinary: Ganga Praharis initiative

Amanat K. Gill, Ekta Sharma, Dr. Pariva Dobriyal

Aim:
NMCG-WII Ganga biodiversity conservation initiative aims to strengthen river conservation efforts by mobilizing local communities and mainstreaming conservation in the village level developmental processes.

Location:
The project is being implemented in the Ganga river basin.

Methods:
Creation of a cadre of volunteers identified from within the riverside communities, and designing mechanisms for sustained conservation efforts. Volunteers were identified through a series of regular site-level meetings and workshops with various local stakeholders including river side communities, Panchayati Raj Institutions, government departments, NGOs etc. On the basis of their interest and site-specific requirement trainings were conducted on various aspects of aquatic biodiversity conservation.

Results:
A functional cadre of motivated and trained volunteers, termed as 'Ganga Praharis' (n= 4024), have been identified and registered in 99 districts of 10 Ganga states through site level interactions. 'Ganga Praharis' are initiating the conservation activities (n= 3061) in their respected sites. To ensure sustainability, the linkages between local economy and conservation are being established through green livelihood skill development. To enhance the visibility and establish linkages with various stakeholders an online platform has been created. To create self-reliant communities and ensure sustainability of conservation efforts, 'Ganga Prahari' groups are being institutionalized by registering as civil societies and getting financial support from various agencies.

Conclusion:
The 'Ganga Prahari' interventions are cultivating a favourable environment for fostering a broader societal alliance dedicated to the conservation of the Ganga river basin. These initiatives are actively facilitating the safeguarding and conservation of aquatic biodiversity, instigating the adoption of sustainable practices among communities residing in the Ganga river basin, and creating a grassroots-level movement aimed at ensuring a clean and vibrant Ganga.

Project Title:
Planning and management for aquatic species conservation and maintenance of ecosystem services in the Ganga river basin for a clean Ganga

Principal Investigator(s):
Dr. Ruchi Badola

Researcher(s):
35 Project Personnel

Funding Agency:
National Mission For Clean Ganga

Project Duration:
2020-24

Keywords:
Local communities, participatory management, green livelihoods, river conservation, institutions

Twitter Handles:
@moefcc, @wii_india, @CallingGanga, @cleanganganmcg

Tweet:
Mobilizing lives to keep river flowing: institutionalizing community involvement in river conservation

Project Title:
Establishment of community resilience resource centeres

Principal Investigator(s):
Dr. Ruchi Badola

Researcher(s):
Vinod Chandra Joshi
(Project Associate)

Funding Agency:
Department of Science and Technology

Project Duration:
2022-24

Keywords:
Community resilience, awareness, livelihood, health and hygiene

Twitter Handles:
@moefcc, @wii_india, @IndiaDST

Tweet:
Building socio-economic resilience of local communities to face external shocks

Establishment of community resilience resource Centres

Vinod Chandra Joshi

Aim:
The study aims to create capacities of local people for prevention and precautions in face of pandemic-like situations and develop site-specific green livelihoods for creating resilient communities.

Location:
The study is being conducted in districts Uttarkashi and Tehri Garhwal (Uttarakhand), Bijnor, Prayagraj and Varanasi (Uttar Pradesh), Samastipur (Bihar), Sahibganj (Jharkhand), Murshidabad (West Bengal), Golaghat (Assam) and Bishnupur (Manipur).

Methods:
The community resilience resource centres were established and various activities were conducted to build the capacity of local communities to face the adversities by making them aware of the prevention, precaution and behavioral changes. Awareness was generated through meetings, workshops and distribution of information dissemination material. To strengthen the immunity and create market, local crop based diet is being promoted. Need assessment surveys have been conducted to identify the site-specific livelihood development strategies.

Results:
A total seven community resource resilience centres were established at block Dunda, Uttarkashi, block Devprayag, Tehri Garhwal (Uttarakhand); block Muhhamadpur devmal, Bijnor; Varanasi (Uttar Pradesh), block Bokakhat, Golaghat (Assam), and Block Moirang Bishnupur (Manipur), Sahibganj (Jharkhand). A total 16 sensitization activities on health hygiene and precautionary measure, immunity building, cleanness, and biodiversity conservation was conducted, and 454 participants were participated. More than 100 local people directly received medical and health benefits from community resilience resource centers Uttarkashi and Bijnor. 10 livelihood assessments were conducted and millet and sustainable tourism based livelihoods were found suitable for Uttarkashi district and handicraft was found best suited for Bijnor.

Conclusion:
Awareness regarding preventive and precautionary measure will make the communities more resilient towards any socio-ecological shocks, and strengthening the local livelihoods will increase their ability to avail modern basic facilities.

Gender advancement for transforming institutions (GATI)

Deepika Dogra

Aim:
GATI aimed to nudge institutions of higher education and research towards supporting diversity, inclusion and the full spectrum of talent for their own success and progression.

Location:
Wildlife Institute of India

Methods:
As GATI partner effectiveness of WII was assessed to provide equal opportunity to all, and in particular, women from Science, Technology, Engineering, Medicine and Mathematics (STEMM) areas, at all levels. Representation of women in research at WII was assessed through individual questionnaire survey.

Results:
The WII has a team of highly qualified researchers, including scientists, biologists, ecologists, and conservationists, who are involved in various research projects related to wildlife conservation and management. The number of researchers working at the WII may vary from time to time depending on the ongoing projects. At Present the percentage of women researchers at WII is at a 44% and in the year 2020-2022, over 46% hired candidates were women. Upon analysis of both historical and primary data, it has been ascertained that a mere 5.68% of female PhD recipients from WII are pursuing careers in academia.

Conclusion:
It is imperative to address the barriers and challenges that impede the advancement of women and other underrepresented groups in their academic and professional pursuits. Under the GATI project, the institute developed five action plans towards gender equity and representation, out of which one was executed at WII with the establishment of a crèche for working parents in the institute complex. The initiative will contribute towards retaining the women in the field of wildlife sciences.

Project Title:
Gender advancement for transforming institutions (GATI)

Principal Investigator(s):
Dr. Ruchi Badola

Researcher(s):
Project Associate

Funding Agency:
Department of Science and Technology, Ministry of Science & Technology, GOI

Project Duration:
August 2021-February 2022

Key Words:
Women representation, gender responsiveness, gender advancement, engagement, gender equality

Twitter Handles:
@moefcc, @wii_india, @moefcc, @wii_india, @IndiaDST

Tweet:
Assessing gender responsiveness of educational institutions

Project Title:
Monitoring the vulnerability of mangrove vegetation and carbon stocks to sea level change in Andaman Islands

Principal Investigator(s):
Dr. Nehru Prabakaran

Researcher(s):
Shamna KT (Project Associate I)

Funding Agency:
CIFOR-ICRAF

Project Duration:
2022-23

Keywords:
2004 Tsunami, sea level rise, soil accretion, soil erosion, RSET.

Twitter Handles:
@moefcc, @wii_india,
@shamnaismayil @nehrutp
@RupeshKBhomia
@bioutchimahali
@anooprajsingh23
@AndamanForests

Tweet:
@shamnaismayil presenting "Monitoring the vulnerability of #mangrove vegetation and #carbonstocks to sea level change in Andaman Islands" at Annual Research Seminar @WildlifeInstituteofIndia

Monitoring the vulnerability of mangrove vegetation and carbon stocks to sea level change in Andaman Islands

Shamna KT

Aim:

Vulnerability of mangroves to sea level rise (SLR) is a major concern in the management and conservation of mangroves and coastal biodiversity. The dynamic nature of coastal settings not only influences mangrove resilience to changes but also controls the establishment and survival of newly established seedlings. Mangroves are not always passive biological features in the coastal zone; rather, in many settings they can influence their fate directly in response to sea level rise by altering their surface elevations and to slow down the overall rate of relative sea level rise. Our study aims to understand sediment accretion and erosion rates which can serve as a good indicator of mangroves' resilience against SLR.

Location:

The study was conducted in the Andaman Islands. The 2004 Sumatra-Andaman earthquake that resulted in coastal uplift and subsidence across the Andaman Islands which provides us with an opportunity to examine mangrove response to sea level change as well as to post-disturbance ecosystem recovery processes triggered by Tsunami and relative sea level change.

Methods:

We established 'Rod Surface Elevation Table' (RSET) and data loggers across the Andaman Islands. RSET is a portable field-based instrument designed to measure the sediment accretion rate. The selected site is initially marked with a benchmark to measure the sedimentation rate. It consists of steel rods permanently penetrated up to the bedrock to mark the surface. This benchmark serves as a permanent reference point for measuring sedimentation rate using the elevation table.

Results:

We installed a total of 17 RSET devices across the Andaman Islands. The initial measurements done across two seasons (pre-monsoon, and monsoon) indicated an accretion of sediments at most of the sites. However, more measurements across different seasons are required to report any pattern in sediment accretion rates.

Conclusion:

Our study creates a baseline on understanding sediment accretion and erosion rates which can serve as a good indicator of mangroves' resilience against SLR. These data offer the opportunity to better predict the potential spatial changes in mangrove forest distribution in response to anticipated SLR based on dynamic surface elevation changes.

Utilizing multi-platform remote sensing for canopy height estimation: Implications for carbon stock mapping

Kamana Pokhariya

Aim:
Canopy height is a crucial variable for estimating carbon storage, and using canopy height can reduce the data saturation problem in above-ground biomass estimations. However, at the fine scale (<30 m), detailed maps of canopy height remain scanty due to limited data availability for estimating tree height. In this study, we aim to explore Sentinel 1 and Sentinel 2 datasets to generate high spatial resolution maps of forest canopy height.

Location :
The study area, Panna Tiger Reserve (PTR) lies in north-central Madhya Pradesh. It is part of the Vindhya hill range which is spread across 3,500 km^2, of which 1,597 km^2 constitute the PTR.

Methods:
We conducted the vegetation sampling in the post-monsoon months (September-November) in 2022. Data from 137 plots were used to calculate the mean height of the plot; 70% of the height data were used for training, and 30% for validation. We downloaded Sentinel-1 and 2 datasets for the winter months to derive the remotely sensed predictor variables. R package 'randomForest' was used to model the height. For data visualization and validation, we generated scatterplots and computed the root-mean-square-error (RMSE), respectively.

Results:
Our predictions at 10-meter spatial resolution captured the canopy heights ranging from 3-21 meters. The results show that our prediction based on the satellite data and field datasets yielded reasonable estimates of canopy height with RMSE of 1.7 m. We further compared our results to the globally modelled forest height dataset of GEDI, and our model outperformed the GEDI estimates in terms of capturing the variations in canopy height.

Conclusion:
Our spatially explicit map of canopy height can serve as a crucial metric for monitoring changes and trends in forest structure and associated carbon stocks. Furthermore, it can also enhance the accuracy of species distribution models and can contribute positively to conservation strategies.

Project Title:
Development of landscape management plan and monitoring with reference to Ken-Betwa River link project in Panna Tiger Reserve, Madhya Pradesh

Principal Investigator(s):
Dr. K. Ramesh

Researcher(s):
Kamana Pokhariya (Project Associate II), Sankarshan Choudhary (Senior Project Fellow), Supratim Dutta (Project Associate II), Dibyendu Biswas (Project Fellow), Vandana Tomar (Project Assistant)

Funding Agency:
National Water Development Agency

Project Duration:
2018-2024

Key Words:
Tree height, forest structure, forest monitoring, SAR

Twitter Handles:
@moefcc, @wii_india, @moefcc, @wii_india, @kramesh95, @Dibyendu_shubho, @DuttaS92, @VandanaTomar_17, @SChaudhuri91

Tweet:
Measuring the emerald forest: Canopy Height estimation from optical,SAR and ground observation

Project Title:
Planning and management for aquatic species conservation and maintenance of ecosystem services in the Ganga river basin

Principal Investigator(s):
Dr. Ruchi Badola

Researcher(s):
Sangeeta Angom (Project Scientist), Sana Mukhtar Shaikh (Assistant Training Coordinator), Neha Negi (Assistant Training Coordinator), Anshul Bhawsar (Assistant Training Coordinator), Simran Aggarwal (Project Assistant), Ashmika Aggarwal (Project Assistant), Sheetal Kumar Pal (Project Assistant), Ayushi Pandey (Project Assistant), Md. Danish Kaleem (Project Assistant)
Simren Dogra (Project Assistant), Aarti Chauhan (Project Assistant), Rahul Gupta (Training Assistant)

Funding Agency:
National Mission for Clean Ganga - Ministry of Jal Shakti

Project Duration:
2020-2024

Key Words:
Conservation education, school children, biodiversity, ganga aqualife, Ganga basin river

Twitter Handles:
@moefcc, @wii_india, @CallingGanga, @moefcc, @wii_india, @sangeeta_angom, @DograSimren, @Danish7309, @00_manni

Tweet:
Educating the future custodians of our rivers! The 'Bal Ganga Prahari' programme aims to empower school children of 700 schools along the Ganga basin, fostering awareness, conservation, and a sense of responsibility. #GangaConservation #BalGangaPrahari

Bal Ganga Praharis: 'Tiny hands for nature conservation'

Danish Kaleem, Simran Aggarwal, Aarti Chauhan, Ayushi Pandey

Aim:
The vision of 'Bal Ganga Prahari' programme is to create an aware and responsible society which has internalized the practices of conservation and cleanliness. This programme aims at raising such sensitive future citizens who can manage their environment sustainably. The objective is to educate school children about the biodiversity of the Ganga River and its significance for human well-being, through interesting and innovative mechanisms.

Location:
Eleven Ganga basin states

Methods:
Activities are designed keeping in mind the capability and interests of the students and categorised in four different groups comprising of students of Junior (I -V), Middle (VI-VIII), and senior (IX-XII). 'Bal Ganga Prahari' programme has been linked with various government programmes viz. MissionLife, Har Ghar Tiranga, Har Ghar Tiranga, Swachhta Hi Seva, Vriksharoopan, Van Mahotsav, Ganga Utsav, Nadi Utsav, Catch the Rain etc.

Results:
Through 'Bal Ganga Prahari' programme, seven hundred (N=700) schools have been enrolled as 'Bal Ganga Prahari' Schools along the banks of Ganga basin states where >2500000 school children have been sensitized through >3500 programmes from 2017 to 2023.

Conclusion:
Fourteen (n=14) 'Bal Ganga Prahari' corners have been established at different government schools of Ganga basin states to furnish the knowledge and awareness of Ganga species, designed on the Ganga biodiversity theme and a section of the Ganga library were provided along with exciting activities. We are striving to include curriculum on Ganga biodiversity conservation at schools in accordance with National Education Policy (NEP).

Floristic diversity, vegetation types and status of soil nutrients in Ladakh, Indian Trans-Himalaya

Aimon Bushra

Aim:
The Indian Trans-Himalaya (ITH) is characterized by sparse vegetation cover, often dominated by scrub steppe and alpine arid grasslands. Despite several landscape-level surveys, the region lacks comprehensive information on patterns of plant species diversity and vegetation types in relation to soil characteristics. Such information is vital for predicting the primary productivity, habitat suitability for wild and domestic ungulates and further conservation planning. This study aims to assess diversity of vascular plant species across major vegetation classes and their soil characteristics in Ladakh,

Location:
Ladakh is a unique place for plant studies due to hostile environment present at high altitudes (2500-7600 m).

Methods:
Plant species data was collected using a grid-based sampling design. The base grids of size 3km x 3km were categorized based on geology, precipitation and elevation. Vegetation plots of 1 ha were sampled by laying 5 subplots of size 2m x 2m. Soil samples were analyzed for pH, OC, N, Na and K following standard laboratory protocols. The relationship of plant diversity with environmental variables was assessed via Pearson correlation implemented in R.

Results:
Based on the data of 341 plots (2m x 2m), total number of plant species recorded was 242 (37 families and 93 genera). Major vegetation types included desert steppes, scrub steppes, mixed herbaceous meadows (MHM), marsh meadows, scree vegetation and riverine scrubs. The highest number of species was recorded in MHM. The soils of MHM were found to be rich in OC and N content, while marsh meadows and scree vegetation were slightly acidic than other vegetation types. It was found that aridity, vegetation cover, elevation, and degree of slope positively influence whereas land-surface temperature and potential-evapotranspiration negatively influence plant diversity of Ladakh.

Conclusion:
The study identifies that Ladakh has unique assemblages of plants, studied here as vegetation types. The herbaceous meadows not only support high plant diversity but also seem to regulate soil OC and nitrogen. Plant conservation management practices specific to vegetation-types in cold desert ecosystems could be a promising avenue for nutrient cycling management.

Project Title:
Himalayan alpine iodiversity characterisation and information system network

Principal Investigator(s):
Dr. Gautam Talukdar
Dr. G. S. Rawat

Researcher(s):
Aimon Bushra (JRF)
Jikmat Stanzin (Project Intern)

Funding Agency:
National Mission on Himalayan Studies (NMHS)

Project Duration:
February 2021 – September 2023

Keywords:
Plants alpine cold-desert

Twitter Handles:
@moefcc, @wii_india, @moefcc, @wii_india

Tweet:
#Alpine plants. Floristic diversities in the landscape of climatic adversity: Delving into plant diversity and soil nutrient compositions across major vegetation types in Ladakh #cold desert #Trans-Himalaya

Project Title:
Assessment and monitoring of climate change effects on wildlife species and ecosystems for developing adaptation strategies in the Indian Himalayan region (PHASE II): NMSHE Phase-II

Principal Investigator(s):
Dr. S. Sathyakumar
Dr. Gautam Talukdar

Researcher(s):
Ankit Singh
(Senior Project Fellow)

Funding Agency:
DST

Project Duration:
2022-2026

Keywords:
NA

Twitter Handles:
@moefcc, @wii_india,
@Kshatriyaankit_,
@Vineet_Climate,
@Aashna_wildlife

Tweet:
Introducing our Web-DSS – a game-changing tool for tackling climate change in the Himalayas! 🌍🦋 Join us in safeguarding biodiversity and ecosystems with data-driven decisions. #HimalayaClimateAction 🌿📊 #ConservationTech

A Web-based decision support system (Web-DSS) for visualizing, strategizing, and formulating policies for climate change adaptation in the Indian Himalayan region

Ankit Singh

Aim:

Climate change poses a significant threat to the biodiversity and ecological stability of Himalaya due to the higher rate of warming documented in the region. Understanding the potential impact of climate change on wildlife species and their habitats is essential for making informed conservation and management decisions. This research presents the development of a Web-based decision support system (Web-DSS) to provide a comprehensive assessment of climate change impacts and formulate adaptive strategies to address them.

Location:

The development of Web-DSS is primarily focused on three major river basins: Beas (Himachal Pradesh) in the northwest, Bhagirathi (Uttarakhand) in the west, besides Teesta (Sikkim) and West Kameng basin (Arunachal Pradesh) in the eastern Himalaya.

Methods:

The Web-DSS architecture is designed to optimize scalability and performance, utilizing our in-house server and storage facilities. We leverage ERDAS-Apollo as a platform to host the GUI dashboard for global access.

Results:

The Web-DSS will consolidate data from various sources, including our own intensive field surveys conducted under Phase I and II of the DST-NMSHE, expert-verified species distribution maps, species distribution records, and details about protected areas. Our data partners include state climate change cells and other Task Forces of NMSHE. These data assets are securely stored, managed, regularly backed up, and accessed through a dedicated cloud infrastructure. A GUI-based dashboard will be made available as an open-source platform for various stakeholders.

Conclusion:

The Web-DSS will serve as an online tool to support scientifically-backed decisions for conserving Himalayan Wildlife under climate change. The end product aims to empower researchers, conservationists, and policymakers with a unique platform for the Himalayan region.

Ecosystems in turmoil: A case study of disaster risk assessment at a pilot site of Kailash sacred landscape

Debaleena Chatterjee

Aim:
The Indian part of the Kailash sacred landscape is considered one of the most fragile landscapes of the Himalayan mountain systems, harbouring a wide variety of endemic flora and fauna of regional and global significance. This majestic biodiversity is present in heterogeneous landscapes across different sanctuaries and watersheds. Due to its geological and climatic sensitivity, the terrain has been designated as one of the most vulnerable ecosystems, posing threats to biodiversity. Hence, the study aims to address the first stage of local-level disaster risk assessment and prepare foundational base maps of three major hazards in the area: floods, landslides and forest fires.

Location:
The study was conducted with respect to the Gori Ganga watershed, located in the Pithoragarh district of Uttarakhand.

Method:
A combination of RS and GIS techniques was employed to carry out the analysis. Frequency ratio, which measures the probability of the disaster occurring within a certain factor category relative to its total incidence in the area, and correlation analytics between the various predictors were used to map disaster prone zones in the study landscape. A number of topographic, climatic, anthropogenic, physical and geological predictors were modelled with the disaster points to conduct the investigation.

Results:
The susceptible zones were classified into five categories: very low, low, moderate, high and very high. The lesser Kumaon Himalayan region of the Gori Ganga watershed was identified as highly prone to all the calamities. The rich wildlife in the forested areas of Munsiyari, Dhandhura, Baram, Lumti, Khaliya and Zimya, among others, is at severe risk of declining due to the calamities. We found that 83.5 km^2 of area is highly sensitive to flood events, 133.1 km^2 is vulnerable to landslides and 147 km^2 is highly susceptible to forest fires.

Conclusion:
The findings indicate that extreme precipitation and existing lithology features, along with the elevation profile of the study landscape, induce flood risks. The nature of profile curvature and the presence of central thrust lines, coupled with precipitation patterns, determine landslides. Lastly, closer proximity to the road and settlements were the key drivers of wildfires, demonstrating the pressure of anthropogenic activities in the Gori Ganga watershed, which are contributing to increased fire incidences. The risk zones mapped through this study will form the basis of regional sustainable conservation efforts by involving local communities in decision-making processes to alleviate the impacts of hazardous incidents, protect biodiversity in the landscape and assist planners in prevention, management and strategizing mitigation measures.

Project Title:
Risk management plan of a pilot Site: Kailash sacred landscape, India.

Principal Investigator(s):
Dr. B. S. Adhikari

Researcher(s):
Debaleena Chatterjee (PA-II)

Funding Agency:
ICIMOD, Nepal

Project Duration:
6 months

Keywords:
Disaster, risk, assessment, Kailash sacred landscape

Twitter Handles:
@wii_india, @DebaleenaC066, @BS_ADHIKARI

Tweet:
Kailash sacred landscape is at high risk of biodiversity loss due to frequent natural hazards, as indicated by the susceptibility risk assessment.

Project Title:
National mission for sustaining the Himalayan ecosystem - Phase 2

Principal Investigator(s):
Dr. S. Sathyakumar

Researcher(s):
Irina Das Sarkar,
Senior Project Fellow

Funding Agency:
DST

Project Duration:
5 years

Navigating valleys: A proposal to integrate Lepidopteran Ecology in Himalayan Climate Assessments

Irina Das Sarkar

Aim:
Pervasive anthropogenic alterations of Himalayan landscapes pose serious threats to lesser-studied fauna, particularly ectotherms. While it remains imperative to quantify community trends within climate-vulnerable regions, there exists a scarcity of foundational information concerning biodiversity within non-protected areas of the eastern Himalayas. Owing to their broad popularity and manageable research nature, butterflies serve as ideal indicators for tracking ecological well-being in human-forest matrices. With a larger goal to integrate butterflies into Himalayan climate research, the current study aims to characterize a comparative diversity baseline among four sub-valleys in West Kameng District.

Location:
The study was conducted in West Kameng basin, Arunachal Pradesh. Covering an area of 3800 sq.km., the area lies ahead of the Eaglenest WLS and falls under the eastern Himalayan Biodiversity hotspot.

Methods:
Photographic documentation following time-constrained non-linear counts were deployed to account for species richness. Efforts were standardized across sub-valleys to reduce bias arising from non-uniform efforts.

Results:
The short-term survey reported 82 species across 46 genera, 19 sub-families, and six families, representing 17 RET species (Schedule-I: 2; Schedule-II: 12; Schedule-IV: 3). Nafra valley accounted for the highest species richness, followed by Chug, Sagor, and Sangti. While subtle differences in land-use intensities may be attributable to species differences, more intensive investigations are needed to establish patterns.

Conclusion:
The finding, although preliminary, bridges knowledge gaps regarding butterfly diversity in non-protected regions of the Kameng Protected Area complex. It offers prospects to investigate patterns and processes of community assemblages, and disentangle underlying generalities in environmental drivers that shape ectothermic distributions in anthropogenic interfaces. The study further proposes to examine species distribution and climate models within conservation priority groups across the study area, an approach hitherto scarce in Himalayan arthropod ecology. The overarching aim remains to obtain practical predictions in species distribution and/or movement patterns under climate stressors to gain insights into pockets of refugia within larger fragmented landscapes.

Keywords:
NA

Twitter Handles:
@moefcc, @wii_india, @moefcc, @wii_india, @wii_india

Tweet:
Navigating valleys: A proposal to integrate Lepidopteran ecology in Himalayan climate assessments

Coastal uplift and subsidence shape mangrove-associated Brachyuran crab community across the Andaman Islands

Mayur Fulmali

Aim:
The 2004 Sumatra-Andaman earthquake resulted in coastal uplift and subsidence across the Andaman and Nicobar Islands. This event resulted in the loss of mangrove habitats and arguably, affected the mangrove-associated crabs; however, no research has focused on the implications of these modified mangrove habitats on the crab assemblage. Therefore, the study aimed to document and compare crab diversity and zonation patterns along various seismically altered mangrove habitats and compared the results with the control sites that were not undergone any change.

Location:
The study was conducted across the coastal uplift and subsidence gradient available in the Andaman Islands.

Methods:
The study sites were categorized into subsided sites, uplifted sites, and control sites. Multiple transects were laid at nine study sites from the landward to the seaward zone of the mangrove intertidal habitat to assess the crab distribution. The community composition in each of the three site categories was compared using NMDS and Permutational ANOVA

Results:
A total of 72 species of crabs were recorded from the surveyed sites. Subsided sites showed high species richness than the uplifted sites. Habitat characteristics of both uplifted and subsided sites reflected upon the crab assemblages and their habitat preference. Increased tidal frequency in landward zone of subsided sites is marked by the presence of the crab species that usually prefers the middle zone of the intertidal habitat. In the uplifted sites, the sesarmid crabs were confined to the remnant mangrove vegetation and gecarcinid crabs have colonized the lower intertidal zone. Both of these scenarios demonstrate the shift in crab habitat preference.

Conclusion:
The disturbance (uplift and subsidence) has created multiple microhabitats that need further monitoring of the pioneer mangrove crab species to establish a relationship with mangrove rejuvenation patterns in degraded and newly formed habitats.

Project Title:
Mangrove responses to sea level change along a gradient of tectonic subduction – A multi-disciplinary approach

Principal Investigator(s):
Dr. Nehru Prabakaran

Researcher(s):
Research Intern

Funding Agency:
Department of Science and Technology

Project Duration:
2018-2023

Keywords:
Mangrove, crabs, geomorphology, coastal degradation, biodiversity

Twitter Handles:
@moefcc, @wii_india, @moefcc, @wii_india, @MayurFulmal1, @nehrutp, @AndamanForests

Tweet:
@MayurFulmali1 explaining on how the #mangrove crab communities are responding to the cascading effects of sea level change in #Andaman. Well there are gains and loss for many species. @nehrutp @AndamanForests @SCannicci @fdahdouh1

Project Title:
Pan India assessment and monitoring of endangered species under the Integrated Development of Wildlife Habitat (IDWH) program- Marine turtles

Principal Investigator(s):
Dr. R. Suresh Kumar
Dr. Nehru Prabakaran

Researcher(s):
Parvathi R Nambiar (Project Associate-I),
Arpita Roy (Project Associate-I),
Mohit M Mudliar (Project Associate-I)

Funding Agency:
MoEF&CC

Project Duration:
Two years

Nesting population assessment of sea turtles along the west coast of India

Parvathi R Nambiar

National Marine Turtle Action Plan (2021-2026) was launched by the Government of India and the population assessment of sea turtles is listed as a major activity. Under the IDWH program of MoEF&CC, the Wildlife Institute of India is assigned to undertake sea turtle population assessment across the Indian region. Under this, an assessment of the nesting population along the west coast of India was carried out.

A systematic survey of the beaches was undertaken along the states on the west coast of India. We recorded the total number of turtles nests laid in the 2022-23 season, and an assessment of hatchery management practice was also taken up. The information was collected from the Forest Department personnel monitoring the beaches.

Along the west coast, 107 beaches were surveyed, where nesting by sea turtles was observed in 66 beaches. Across these beaches, except the ones from Gujarat, Olive ridley turtle nesting was observed predominantly (1412 nests). 131 green turtle and 2 olive ridley nests were observed along the Gujarat coast. A latitudinal trend in olive ridley turtle nesting was observed along the west coast, with more nests observed between the latitude 15° and 18° primarily on the Maharashtra & Goa coast (1132 nests). Nest protection methods along the west coast include hatcheries (42 hatcheries) and insite nest protection measures (109 nests). In these protected nests, the average clutch size ranged between 101 and 122 eggs for different states, and the state-wise emergence success varied between 48% and 65%.

The important nesting beaches for each state have been identified based on the information gathered, and habitat assessment of these beaches is being undertaken. A systematic format of data collection and training of the frontline staff is planned as part of this project to establish a national-level database. Further assessment of the remaining coast will be taken up this nesting season.

Keywords:
Sea turtles, west coast of India, nesting population assessment, habitat assessment, hatchery management.

Twitter Handles:
@moefcc, @wii_india

Tweet:
NA

Monitoring the effectiveness of capacity building of stakeholder in Ganga river basin

Sana Mukhtar Shaikh, Neha Negi, Simren Dogra, Dr. Sangeeta Angom

Aim:
Lessons learnt from other river restoration projects, globally, have shown that success of efforts to restore the river ecosystem would depend on capacity building and engagement of stakeholders. The main objective is to develop the capacity of forest officials of Ganga basin states and other stakeholders for biodiversity monitoring, conservation of wetlands, rescue and rehabilitations, community mobilization and conservation education.

Location:
Eleven Ganga river basin states

Methods:
Monitoring and evaluation was done based on the Kirkpatrick's model using a random follow up E-questionnaire assessment to examine the 'after' training efficacy and effectiveness amongst the participants from 2017 to 2023. Comparison was done between pre and post impact assessment to evaluate how much the training programmes contributed to stakeholder's groups.

Results:
As a part of this initiative, sixteen (n=16) spearhead training workshops were conducted in which 736 spearhead team members were established and trained on different aspects of biodiversity conservation. Seventy-two (n=72) onsite training and skill building programmes have been conducted.

Conclusion:
We found differences in levels of awareness, attitudes, opinions before and after the programmes. Most participants saw pollution and climate change as major threat to the river and its biodiversity. Our efforts suggest that such programmes particularly undertaken at the grassroots levels result in change in attitudes of stakeholders and provide them a pathway to engage meaningfully in river restoration. These programmes have helped to generate a pool of trained cadre of citizen scientists who can mobilize others to participate in biodiversity monitoring and mitigating the climate change impacts on the Ganga river ecosystem. A training database at the WII-NMCG webpage have been developed as a single point source to disseminate training information to a wider audience.

Project Title:
Planning and management for aquatic species conservation and maintenance of ecosystem services in the Ganga river basin

Principal Investigator(s):
Dr. Ruchi Badola

Researcher(s):
Sangeeta Angom (Project Scientist), Sana Mukhtar Shaikh (Assistant Training Coordinator), Neha Negi (Assistant Training Coordinator), Anshul Bhawsar (Assistant Training Coordinator), Simran Aggarwal (Project Assistant), Ashmika Aggarwal (Project Assistant), Sheetal Kumar Pal (Project Assistant), Ayushi Pandey (Project Assistant), Md. Danish Kaleem (Project Assistant) Simren Dogra(Project Assistant), Aarti Chauhan (Project Assistant), Rahul Gupta (Training Assistant)

Funding Agency:
National Mission for Clean Ganga, Ministry of Jal Shakti

Project Duration:
2020-2024

Keywords:
Biodiversity, training, skill development, river ecosystem, restoration

Twitter Handles:
@moefcc, @wii_india, @CallingGanga, @moefcc, @wii_india, @sangeeta_angom, @DograSimren

Tweet:
Capacity building of stakeholders is the heart of successful river restoration. In the Ganga basin, we have empowered citizen scientists, shifted attitudes, and united for biodiversity conservation. #GangaRestoration #RiverConservation

Project Title:
Management of invasive species in wet grasslands of Kaziranga Tiger Reserve, Assam

Principal Investigator(s):
Dr. Ruchi Badola
Dr S.A. Hussain
Dr. B. S. Adhikari

Researcher(s):
Umar Saeed (Project Fellow),
Rashmi Das (Project Assistant)

Funding Agency:
National Tiger Conservation Authority (NTCA)

Project Duration:
2018-2023

Unveiling the Green Invaders: Mapping dominant invasive plants in wet grasslands of Kaziranga Tiger Reserve, Assam

Umar Saeed

Aim:
Invasive species are reducing grasslands worldwide, thus the primary objective of this study is to understand the distribution pattern and potential habitats of the most abundant invasive plant species (IPS) to contribute to a better understanding of the ecological consequences of invasion in the wet grassland of Kaziranga Tiger Reserve (KTR), Assam.

Location:
The study is conducted within the Kaziranga Tiger Reserve (KTR), Assam. The area is characterized by a wet grassland ecosystem, highly susceptible to IPS. The diverse habitats include open forests, moderately dense forests, non-forest areas, and water bodies.

Methods:
The study employed vegetation sampling across the landscape using grid-based sampling plots for systematic data collection. The eight most abundant IPS within the reserve were identified. The classical heat map method was used to visualize the distribution patterns and potential habitats preferred by the selected invasive species. Heat maps were created based on the abundance and occurrence in different habitat types across the study area.

Results:
The study revealed that *Mikania micrantha, Ageratum conyzoides, Chromolaena odorata,* and *Ipomoea carnea* are the most dominant IPS within the landscape. These species are concentrated primarily in open forests and moderately dense forests. However, *Ipomoea carnea* dominates in non-forest areas and water bodies (79.64 sq.km). *Mikania* was observed to occur in the largest area (187.35 sq.km), followed by *Ageratum* and *Chromolaena,* with extents of 166.41 sq.km and 82.44 sq.km respectively. While many other invasive plants such as *Mimosa diplotricha, Lantana camara, Lippia alba* and *Parthenium hysterophorus* can sustain in various habitats, as their accelerated growth and competitive success are contingent on specific conditions.

Conclusion:
The findings provide valuable insights in identification of eight most dominant invasive species, their distribution patterns and potential habitats within KTR. Highlighting dominant species across diverse habitats underscores the urgency of precise management strategies. Employing the classical heat map and grid-based sampling, the study aids in pinpointing crucial areas for future control of invasive species.

Key Words:
Invasive plant species, heat map, distribution, vegetation sampling, Habitat

Twitter Handles:
@moefcc, @wii_india,
@RuchiBadola2,
@SyedAinulHussa2

Tweet:

NA

Dugong conservation in India: A review of progress and a glimpse forward

Swapnali Gole

Sameeha Pathan, Chinmaya Ghanekar, Sohom Seal, Prachi Hatkar, Sagar Rajpurkar, Sweta Iyer, Srabani Bose, Sumit Prajapati, Vabesh Tripura, Garima Dhiman, Sonia Negi, Anagha Biju, Akarsh Aggarwal, Oishinee Chakraborty, Nehru Prabakaran, K. Sivakumar, Dr. J. A. Johnson

Aim:
An overarching goal of the 'CAMPA Dugong' project was to address gaps in dugong distribution, status, and management in India. We, thus, aimed to create a robust database on critical dugong habitats (CDH), coupling ecological research with technology and threat assessments. Additionally, we facilitated community and stakeholder participation with managers to provide a comprehensive roadmap for dugong management and conservation in India.

Location:
Gulf of Kutch (GoK, Gujarat), Palk Bay-Gulf of Mannar (Tamil Nadu), Andaman and Nicobar Islands (ANI).

Methods:
We employed a multifaceted approach to map seagrasses and define foraging areas using quadrate assessments (0.25m2), line transects (50m) and grab sampling. Dugong distribution maps were created through systematic boat surveys, drone surveys and citizen science participation. Threat maps were generated using grid sampling (1x1 km) to map boat pressures in CDHs. Drones were utilized for systematic transects and focal-scan sampling. Remote sensing methods were employed to both verify the presence of seagrass and predict its distribution.

Results:
We mapped and studied 19 dugong foraging grounds within the Western GoK and seagrasses within 448 km^2 from the Dugong Conservation Reserve (DCR) in Palk Bay. In ANI, we identified 66 seagrass meadows, out of which 19 are being frequented by dugongs. Further, remote sensing methods successfully yielded species and habitat distribution models. Usage of drones has confirmed dugong presence from all three sites, with observed densities of 1.4 and 1.6 from DCR and Ritchie's archipelago respectively. A massive community and stakeholder engagement (280 sensitization, n=103 capacity building) yielded to > 500 dugong sightings from all sites, including data deficient regions. We mapped and studied 19 dugong foraging grounds within the Western GoK and seagrasses within 448 km^2 from the Dugong Conservation Reserve (DCR) in Palk Bay. In ANI, we identified 66 seagrass meadows, out of which 19 are being frequented by dugongs. Further, remote sensing methods successfully yielded species and habitat distribution models.

Conclusion:
Presence of dugongs has been confirmed from GoK, with a successful understanding of foraging patterns. The first dugong conservation reserve has been created in Tamil Nadu, with critical scientific inputs from the CAMPA Dugong project. Reports of herds (n=> 60) after four decades in ANI has changed our understanding of the social dynamics of dugongs in the region. We recommend implementing systemic aerial surveys and artificial intelligence for efficient monitoring of dugong populations across habitats.

Project Title:
Recovery of dugongs and their habitats in India: An integrated participatory approach

Principal Investigator(s):
Dr. J. A. Johnson,
Dr. Nehru Prabakaran

Researcher(s):
Swapnali Gole
(Project Fellow)

Funding Agency:
CAMPA

Project Duration:
2016-2023

Key Words:
local communities, marine mammal, seagrasses, habitat conservation, citizen science

Twitter Handles:
@moefcc, @wii_india, @thegrassyfish, @the_sohom, @prachihatkar1, @RajpurkarSagar, @Swetalyer4, @srabosapiens, @_anagha_b, @Akarshaggarwal6, @OishineeC, @nehrutp, @ksivakumarwii, jayjohny2013

Tweet:
Get ready to dive into the fascinating world of dugong conservation in India! Let's get our flippers on and learn to be dugong champions together! #dugongsforever

Project Title:
Planning and management for aquatic species conservation and maintenance of ecosystem services in the Ganga river basin for a clean Ganga

Principal Investigator(s):
Dr. Ruchi Badola
Dr. Syed Ainul Hussain

Researcher(s):
113 Project Personnel

Funding Agency:
National Mission for Clean Ganga, Ministry of Jal Shakti

Project Duration:
January 2020 till December 2024

Keywords:
NA

Twitter Handles:
@moefcc, @wii_india, @moefcc, @wii_india, @RuchiBadola2, @SyedAinulHussa2, @cleanganganmcg

Tweet:
The project used cutting-edge scientific methods and grassroot level interactions with local communities and other stakeholders along the principles of "Jan Bhagidari" to derive replicable models for an integrated science–policy–society interface.

Planning and Management for aquatic species conservation and maintenance of ecosystem services in the Ganga river basin for a clean ganga – Learning and achievements

Shivani Barthwal

Aim:
River basins are complex socio-ecological systems that cross multiple administrative boundaries and involve interests of multiple players. For conservation of the riverine ecosystem it is essential to identify the factors governing dispersal of key aquatic species. This study thus aimed to identify and prioritize high biodiversity stretches and prepare action plans for their conservation involving multiple stakeholders.

Location:
The study was carried out in the Ganga river basin spread across 11 Indian states

Methods:
The study adopted a multi-disciplinary approach. To gain insight into ecological richness, habitat variability, and pollution, river surveys were undertaken. To deal with the emergent situation, rescue and rehabilitation centres were established. Cadres of spearhead team and first responders were created to carry forward aquatic species conservation and facilitate timely action for aquatic species in distress. Local community members were reached out and a cadre of volunteers "Ganga Prahari" was created. To align livelihoods with biodiversity conservation, sustainable livelihood trainings were imparted. To educate the masses, conservation education and outreach activities were conducted.

Results:
40% of the Ganga basin has high biodiversity values. 12% of the river stretches were identified as conservation priority zones. The heavy metal concentration varied from below detection limits to 0.301 mg/L. About 6000 turtles were rescued and rehabilitated. About 1043 stakeholder are trained to spearhead conservation actions. 4024 volunteers are enrolled in the Ganga Prahari cadre, of which >50% are women. About 3800 individuals were trained in green livelihoods. Three interpretation centres and 48 Jalmala Samwads were established along Ganga, Yamuna, Gomti and Gandak rivers to educate the masses.

Conclusion:
The findings highlight importance of river confluences, and Protected Areas for aquatic biodiversity conservation. The pollution hotspots were found near the urban agglomerations and downstream of drains. The pilot human development programmes have put in place a network of civil society to promote river conservation. Spearhead teams are internalizing capacities for aquatic species conservation. Livelihood interventions are restoring trust of the local communities in Ganga conservation and contributing to Arth Ganga programme. Dissemination of scientific information is strengthening science–policy–practice interface, enhancing coherence and helping stakeholders make informed decision.

"A sound solution: Pingers to reduce the mortality of river dolphins"

Merin Jacob

Aim:
The Ganges river dolphins are endangered fresh water cetaceans present in the rivers of the Indian subcontinent. They are blind species and use echolocation to navigate murky waters. The echolocating clicks produced by the dolphins are unable to sense presence of monofilament fishing nets and hence lead to net entanglement, which is a leading cause of river dolphin mortality. This study aims to understand the use and effectiveness of acoustic deterrents 'pingers' in deterring river dolphins from nets and thereby curbing their mortality.

Location:
The experiment was carried out in the Guwahati district of Assam in the Brahmaputra River

Methods:
The experimental setup utilized both acoustic and visual methods to assess the response of dolphins to acoustic deterrents. The experiment spanned for 36 days, and divided into three phases. The initial phase, pre-treatment phase, was to gaining insights into the natural acoustic activity of dolphins in the area followed by treatment phase, during which active pingers were deployed on fishing nets to evaluate the efficacy of the pingers in deterring dolphins from the nets. This was followed by post-treatment phase to learn how dolphins responded after the removal of the pingers. Additionally, visual observations for dolphins surfacing near the nets provided determine the proximity of dolphins to the nets and classify them according to age class. The potential impact on fish catch was studied by collecting data from both pingerd and non-pingerd net.

Results:
The study found that pingers offered 90% deterrence to river dolphins. Pingered nets had dolphin detection rate of 2.20± 0.33/hour as against non-pingered nets which had detection rate of 22.87 ± 0.71/hour dolphin positive minutes. No evidence for habituation to pingers, habitat avoidance after pinger removal or a change in fish catch was found during the study.

Conclusion:
The use of pingers seems to be the most promising solution currently available to minimize net entanglement mortalities in the Ganges river dolphins. These results have critical implications for the conservation of other species of river dolphins around the world.

Project Title:
Development of conservation action plan for river dolphins (*Platanista gangetica gangetica*)

Principal Investigator(s):
Qamar Qureshi,
Dr. Vishnupriya Kolipakam

Researcher(s):
Merin Jacob, Aaranya Gayathri, Sunny Deori, Hiyashri Sarma, Syeda Tabassum Tasfia, Anurag Rokade, Ranjana Negi, Jury Roy, Shah Alom, Abdul Wakid

Funding Agency:
CAMPA

Project Duration:
2016-2025

Key Words:
Acoustic deterrents, net entanglement, Ganges river dolphins, By-catch

Twitter Handles:
@moefcc, @wii_india, @moefcc, @wii_india, @merinjacob7

Tweet:
NA

Project Title:
Assessment of the ecological status of select Indian rivers for conservation planning

Principal Investigator(s):
Dr. Ruchi Badola

Researcher(s):
A team of 40 researchers

Funding Agency:
National River Conservation Directorate, Ministry of Jal Shakti

Project Duration:
till March 2025

Keywords:
NA

Twitter Handles:
@moefcc, @wii_india, @RuchiBadola2, @SyedAinulHussa2

Tweet:
WII team conducted biodiversity surveys to assess conservation priority area in the Barak riverscape

An insight into ecological status of select Indian rivers

Dr. Tanveer Ahmed

Population increment allied with rapid urbanization, land-use changes, large-scale industrial growth, heavy metal pollution, excessive water abstraction, sand mining and inter-sectoral and inter-state water allocation issues has threatened the Indian rivers and their biodiversity. Therefore, current study was conceived to spearhead river conservation in Barak, Narmada, Mahanadi, Godavari, Cauvery, Periyar and Pamba river for biodiversity conservation. We have conducted biodiversity assessment in three rivers viz., Barak, Godavari, and Periyar and delineated conservation priority area in Barak river.

Various taxa were sampled within selected 5 km stretches in Barak (13 segments), Godavari (20 segments) and Periyar rivers (14 segments) during monsoon (June to September 2022) and post monsoon season (December 2022 to April 2023). Within each segment, data on species richness, abundance, were collected by laying three transects employing cast and gill netting for fish, McKinnon's Species Richness method for birds and Visual Encounter method for amphibians and reptiles. Habitat suitability of various aquatic fauna was determined using climate data (temperature, precipitation, and humidity), topographical features (river width, depth, elevation, slope), land cover classes, soil, chemical feature (DO, electrical conductivity, TDS, pH, Salinity, Nitrate) and hydrological attributes (river flow) was used to derive. Habitat suitability models of multiple fauna were overlapped to determine conservation priority areas in Barak riverscape.

Periyar riverscape supported maximum richness of plants and Godavari riverscape to maximum richness fish, amphibians, reptiles and birds. Except Godavari riverscape, aquatic mammals (otters) were recorded in the Periyar and Barak riverscape. Threatened species was sighted more in Periyar, as compared to Godavari and Barak riverscape. Conservation Priority Areas was observed in the middle and upper zone the Barak riverscape. Approximately 8.3% of the Barak river stretches in the Barak riverscape is ecological hotspot, which could be brought under the preview of Indian Wild Life (Protection) Act, 1972, for long-term sustenance of biodiversity.

Where do solitary nesting Olive Ridley turtles go? Tracking the migratory journeys of turtles from the Maharashtra coast

Mohit M. Mudliar

Aim:
Olive ridley sea turtles, nesting solitarily in India, are poorly studied, with little or no information on their post-nesting movements and their foraging grounds. This study aimed to understand the nearshore and migratory movement of turtles from west coast of India through satellite tracking.

Location:
The satellite tagging of turtles was undertaken on three beaches of Ratnagiri district along the Maharashtra coast, between 2022 and 2023.

Methods:
Satellite tags were deployed on seven female turtles. A continuous-time state-space model was employed for track correction, and study changes in the movement behaviour along the modelled path. Additionally, dive data obtained from the tags that included depth, shape and dive length were summarised.

Results:
The tracking period for turtles ranged between 2 and 166 days. They resided in the breeding areas for 22 to 41 days and primarily stayed in areas within 30-meter depth. The tagged turtles remained associated with the west coast's continental shelf, and the turtles' slow-moving phases spatially overlapped off the Karnataka coast. However, one turtle migrated far south to the waters off the Sri Lankan coast and then moved into the Bay of Bengal. At the time of the last location, tagged turtles were 190 to 2264 km from the nesting site. The median dive depth recorded was 55 meters, and the median dive length was 24 minutes. The diving behaviour of turtles differed between the continental shelf and open waters.

Conclusion:
The findings from this tracking effort indicate that olive ridley turtles that nest along the Maharashtra coast include populations that are resident of the Arabian Sea and are also joined by long-distance migrants from the Sri Lankan waters and the Bay of Bengal. The Malabar upwelling zone off Karnataka and northern Kerala coast could be an important foraging area based on the movement patterns of turtles in this study. The waters off the northeast Sri Lankan coast are a known foraging ground for olive ridley turtles from Odisha, which could be true for those from Maharashtra.

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Project Title:
Tracking the nearshore and migratory movements of Olive Ridley Sea turtles occurring in the coastal waters of Maharashtra

Principal Investigator(s):
Dr. R. Suresh Kumar

Researcher(s):
Mohit M Mudliar

Funding Agency:
Mangrove Foundation, Maharashtra Forest Department

Project Duration:
2021-2023

Keywords:
NA

Twitter Handles:
@moefcc, @wii_india, @MangroveForest, @MahaForest, @sureshwii, @mohit_mudliar

Tweet:
NA

Project Title:
Herpetological exploration of Namdapha- Kamlang landscapes, India

Principal Investigator(s):
Dr. Abhijit Das

Researcher(s):
Naitik Patel,
(PhD Scholar, WII)

Funding Agency:
National Geographic Society

Project Duration:
2020-2023

Diverse, disguised, and delicate: Exploring herpetofaunal diversity in Arunachal Pradesh, India.

Naitik Patel

Aim:

The primary objective of this study is to carry out first ever systematic herpetofaunal exploration in the Kamlang-Namdapha Landscape (KNL) in Arunachal Pradesh, India, to document the herpetofaunal diversity.

Location:

Kamlang-Namdapha Landscape (KNL).

Methods:

The sampling was planned in two phases, during peak monsoon and post monsoon (July to October) and Pre-monsoon (February to April) from 2022 to 2023. We conducted visual encounter search (VES) diurnally and nocturnally constrained by time (one man-hour of opportunistic searching) along with opportunistic observation. We used Marantz recorder and unidirectional Schhneiser Microphone for recording amphibian calls. With each call recording, environmental parameters were documented. We used Raven Pro 1.5 bioacoustics analysis software to analysis recorded call. We followed morphological taxonomy for snakes (Das *et al.* 2010), Anurans (Das *et al.* 2019), and saurian (Deepak *et al.* 2016). For natural history data, we used pesola digital balance and measure body length of each specimen encountered.

Results:

In our preliminary survey, we recorded 82 species of herpetofauna including 45 species of amphibians belonging to 25 genera and nine families, and 37 species of reptiles belonging to 24 genera and eight families. Out of this, 40 species of amphibians and 32 species of reptiles were recorded from Namdapha Tiger Reserve, while 15 species of amphibians and 12 species of reptiles were recorded from Kamlang Tiger Reserve.

Conclusion:

Despite the recognition of their significant biological richness, the northeast India continues to be widely acknowledged as data poor regions pertaining to their herpetofauna. This study presents the initial comprehensive documentation of the herpetofauna diversity within the KNL, serving as a fundamental reference for monitoring the herpetofauna in this region. The findings of this study highlight the significance of conducting biodiversity inventories for prioritizing conservation measures within the Protected Areas for the herpetofauna.

Key Words:
Biodiversity hotspot, cryptic diversity, amphibians, reptiles, eastern Himalaya

Twitter Handles:
@moefcc, @wii_india, @naitikpmsu , #AbhijitDas

Tweet:
Explored Arunachal Pradesh's herpetofauna in Kamlang-Namdapha. 82 species found, highlighting rich biodiversity.
#Herpetofauna
#ArunachalPradesh
@ArunForests @KamlangTiger
@NamdaphaTR

Conservation actions for Manipur's Brow-antlered deer or Sangai: Progress achieved so far

Mirza Ghazanfarullah Ghazi

Aim:

The Manipur's Brow-antlered deer or Sangai persists as a single, small and isolated population in the Keibul Lamjao National Park (KLNP), Manipur. This last remaining population in the wild is highly susceptible to extinction owing to its compromised population characteristics and climate change impacts. The Sangai recovery programme aims to secure the existing population at KLNP and establish a second population in the wild within Manipur. A critical aspect of this initiative involves actively engaging local communities in the conservation process while simultaneously gathering ecological information on the species.

Location:

The project is being implemented at the Keibul Lamjao National Park in Manipur.

Methods & Results:

An integrated management plan of KLNP has been prepared to strengthen the existing habitat conditions of the park. In the process of establishing a second population through conservation breeding, progress is being made towards developing the 'Conservation Breeding Centre' at KLNP. Population estimation of Sangai and associated species using the point-count method has unveiled a concerning decline in Sangai density estimates. Conversely, there is an observable uptrend in hog deer density. The demographic analysis using microsatellite markers revealed the presence of widespread historical genetic bottleneck events and critically low contemporary effective population size (median = 7, 4.7–10.8 at 95% CI). Stress physiological analysis revealed higher faecal glucocorticoid metabolite concentration (28.73 ± 16.93 pg/50 µl) in the wild than the captive populations.

Initiatives have been implemented to engage local communities through various means, including awareness and sensitisation (n=80), consultations (n=35), trust building (n=14) and capacity building (n=36) on sustainable livelihood promotion, thus weaning away the local dependence on the park's resources. A total of 13 'Self-Help Groups' were instituted for local women, and further community mobilisation is ongoing. Furthermore, veterinary investigations targeting prevalent diseases, organisation of vaccination camps, and wildlife rescue and rehabilitation operations have been carried out in the vicinity of the park.

Conclusion:

These interventions assisted in identifying critical factors affecting the existing population and provided targeted management interventions for strengthening the habitat conditions and ensuring the long-term conservation of Sangai, along with sustainable development of the local communities around KLNP.

Project Title:
Conservation action plan for Manipur's Brow-antlered deer or Sangai: An integrated approach

Principal Investigator(s):
Dr. Ruchi Badola
Dr. Syed Ainul Hussain

Researcher(s):
Mirza Ghazanfarullah Ghazi (Conservation Officer)
Dr. Nengneikim Baite (Veterinary Officer),
Akoijam Santikumar Singh &
Dr. Sharmila Naosekpam (Project Fellows),
Roshani Bisht (Project Assistant).

Funding Agency:
National CAMPA Authority.

Project Duration:
2016-2025

Keywords:
Population density, genetics; physiology, community participation.

Twitter Handles:
@moefcc, @wii_india, @moefcc, @wii_india, @RuchiBadola2, @SyedAinulHussa2, @MGhazanfarullah, @ASantikumar

Tweet:
Converging wildlife conservation with societal welfare: Conservation of 'Sangai' - The Pride of Manipur.

Project Title:
Implementing rhino DNA indexing system (RhoDIS) to counter rhino poaching threat and aid rhino population management in India- Phase II

Principal Investigator(s):
Dr. Samrat Mondol

Researcher(s):
Shrewshree Kumar,
(Senior Research Fellow)

Funding Agency:
MoEF&CC, WWF-India

Project Duration:
2021-2024

Chasing the unicornis: evolutionary history, genetic health and conservation of the Indian rhinoceros

Shrewshree Kumar

Aim:

The recovery of Indian rhinoceros is considered a great conservation success in the Indian wildlife history. As most of the extant rhino populations are reaching carrying capacities, their future persistence depends on identification of potential habitats and translocation based conservation approaches. Implementation of such efforts would greatly benefit from the knowledge of species evolutionary history and detailed genetic assessments of these populations. Our study aims to investigate rhino evolution, phylogeography and genetic health across India.

Location:

All the wild rhino bearing areas of India.

Methods:

We collected biological samples from all the parks and generated complete mitogenome from all the extant wild Indian rhino populations (n=16 individuals). Further, we identified all polymorphic sites and assessed rhino phylogeography (2531 bp mtDNA, n=111 individuals) using Bayesian and multivariate approaches. Divergence times among the rhino maternal clades were estimated using phylogenomic tools. To identify the number of genetic subpopulations (or K) integrated multiple clustering analysis were used on 504 rhino individuals. Genetic health of the subpopulations was also estimated using various genetic indices.

Results:

Results indicate three distinct genetic clades (Fst value 0.68–1) corresponding to the states of Assam, West Bengal and Uttar Pradesh. Bayesian analyses suggest a recent divergence of Indian rhinos ~950 Kya. Different populations coalesce at ~190–50 Kya corroborating with known paleobiogeographic events in the Indian subcontinent. Multiple clustering approaches indicated six genetic subpopulations (k=6) in Indian rhinos. The matrices of genetic health showed poor situation in Pobitora WLS (Assam), Gorumara, Jaldapara (West Bengal) and Dudhwa NP (Uttar Pradesh).

Conclusion:

The phylogeography and phylogenomic outcomes along with available paleobiogeographic history suggest recognition of three 'Evolutionary Significant Units (ESUs)' in Indian rhino. The six distinct genetic clusters along with park level genetic health assessment identified population-specific management concerns. Future rhino reintroduction programs should consider these details to ensure genetically diverse populations for better evolutionary and ecological stability.

Keywords:
Megaherbivore conservation, evolutionary significant units (ESUs), genetic clusters, reintroduction programme

Twitter Handles:
@moefcc, @wii_india, @ShrewshreeK, @amitsharma_ghy, @WWFINDIA

Tweet:
Investigating the evolution of Indian rhinos and their genetic health across India. #RhoDIS_India, #WWF_India, #Indianrhino #unicornis #molecularecology

Genomic studies on Rusty-spotted cat

Dr. Shomita Mukherjee

Aim:

The project, Genomic studies on Rusty-spotted cat was initiated as part of a larger project on small cats and a workshop on upgrading the Rusty-spotted cat (RSC) captive breeding facility in Sanjay Gandhi National Park (SGNP), Mumbai. There were nine RSC in captivity at the breeding centre. Genomic data would be invaluable in the captive breeding programme and also aid the conservation of the species in natural habitats. The project also aimed to understand how past climate change could have affected the long-term demographic history of RSC.

Methods:

At the time of sampling, only two female (siblings) RSC were alive. Blood and buccal swabs from both were collected by the park veterinarian and couriered to IISER Tirupati for further processing. Extracted DNA was sequenced over Illumina Novaseq 6000 sequencer (150 bp paired-end) for 90x and 30x coverage.
Standardized web-based pipelines and bioinformatic tools for genomic analyses were used to assemble the genome. Demographic change for RSC over 500,000 years (Late Quaternary) was performed through Pairwise Sequentially Markovian Coalescent (PSMC) analysis.

Results:

The two genomes yielded 308.85 and 78.84 Gigabases of data. The size of the RSC genome was estimated at 2.350 Gbp, like its congeners the Asian Leopard Cat and Fishing Cat. Demographic history of RSC suggests declines in the effective population size during glaciation times supporting results of an earlier study on their past climatic niches.

Conclusions:

The current time period is predicted to be climatically stable for RSC and hence a captive breeding programme is not urgently required. Nevertheless,
information from siblings alone is not useful for the current captive breeding programme. Genomic data from multiple individuals throughout the distribution range of the species should be the next step towards understanding this small, elusive cat's population dynamics and evolution and in planning a robust captive breeding programme, if needed.

Project Title:
Genomic studies on Rusty-spotted cat

Principal Investigator(s):
Dr. Shomita Mukherjee
Nandini Rajamani (IISER Tirupati)
Nayan Khanolkar

Researcher(s):
Nagarjun Vijay, Ajinkya Patil, IISER Bhopal,
Nivetha Murugesan, Aashritha Sankara, IISER Tirupati

Funding Agency:
Maharashtra Forest Department

Project Duration:
2022-2023

Key Words:
Demography, quaternary, PSMC, past-climate, effective population Size

Twitter Handles:
@ShomitaMukherj1; @NandiniRajamani; @nayankhanolkar; @Indianpeople; @ajinkya17Bp; @nivetha_ecoevo; @Aashritha95; @MahaForest; @SunilLimaye2

Tweet:
Preliminary analysis of the first-ever genomic-level information for the smallest cat in the world, Rusty-spotted Cat, reveals declines in effective population size during the quaternary glaciations due to climatic events.

Project Title:
Landscape level patterns of mammalian assemblages in Bellary district, Karnataka

Principal Investigator(s):
Dr. T. Ramesh

Researcher(s):
Mr. Asit Kumar Behera
(INSPIRE and SERB-OVDF Fellow)

Funding Agency:
DST-INSPIRE, Govt. of India &
SERB-OVDF, Govt. of India

Project Duration:
5 Years

Keywords:
Activity; camera trapping; habitat use; protected area; reserved forest

Twitter Handles:
@AsitKumarBeher1

Tweet:
Landscape and patch attributes impacting the patterns of mammalian assemblages in Ballari district, Karnataka

Landscape and patch attributes impacting the patterns of mammalian assemblages in the fragmented landscape of Ballari district, Karnataka

Asit Kumar

Aim:
Anthropogenic activities cause habitat loss and fragmentation across different landscapes. Land use activities and human presence adjacent to forest patches influence habitat use and activity of wild mammalian species. Species ecological and life history traits may play a crucial role in determining their success in coexisting with human in human-dominated landscapes. In recent decades, landscapes of Deccan plateau are experiencing more rapid land use changes than usual, which have affected the distribution and behaviour of the species inhabiting. Therefore, we investigated the effects of different forms of human presence and land use changes on the habitat use of seven mammalian species with different functional traits. We also examined the impact of land-use types on their activity patterns and activity levels.

Location:
Ballari district, Karnataka, India

Methods:
We conducted a camera-trapping survey in Ballari district January 2019 and October 2021. We deployed camera-traps at 1457 sampling grid cells across Protected Areas (PAs), Reserved Forests (RFs), and adjoining fringe mosaic farmlands (FMFLs). We assessed the influence of 19 environmental covariates related to habitat features, landscape-level human presence, local-level human presence, and climate on species habitat use using single season occupancy models. We also examined the diel activity patterns and activity levels of mammals within different land-use types.

Results:
Four species exhibited a net negative response to increasing human presence, while three species exhibited positive response. Proximity to farmlands, and settlements positively influenced the habitat use for *Panthera pardus*, and *Lepus nigricollis*, respectively. Increased direct human presence negatively affected *Sus scrofa* habitat use. Large body-sized species had higher diurnal activity in PA/RF compared to FMFL whereas smaller-sized (≤ 2.2kg) species had similar activity patterns across land-use types. Generalist meso-predators exhibited more diurnal activity in RF/FMFL.

Conclusion:
Our results revealed that species ecological and life-history traits were strong predictors of their responses to increasing human presence, favouring smaller and generalist species. Our study provides insights into the complex mechanisms through which human activities shape mammal communities globally, that would help in long-term conservation of species.

Present imperfect, future precipitous? Wildlife assemblages and impacts from an upcoming railway infrastructure in a dry deciduous forest-scape of Jharkhand

Rohit R. S. Jha

Aim:
Following MoEF&CC's Forest Advisory Committee's directions, in association with the Jharkhand Forest Department, we aim to compile an 'Integrated Wildlife Action Plan' (IWAP) for forest areas impacted by DFCCIL's planned railway infrastructure (36.32 route-km).

Location:
A contiguous forest block of about 600 sq.km was defined as the immediate impact zone (IIZ), based on ecological criteria. The IIZ lies within Jharkhand's three Forest Divisions – Hazaribagh Wildlife (Gautam Buddha & Koderma sanctuaries), Hazaribagh West, and Koderma – in a largely dry deciduous forested landscape of the Chotanagpur (6A) biotic province.

Methods:
Two nested sampling strategies – one within a 1km-belt along the proposed railway alignment (500m either side), while another within the larger IIZ – helped assess assemblages and abundance indices for selected wildlife groups (plants, amphibians, reptiles, birds & mammals). Field methods employed included vegetation plots, camera-trapping, standardised sign surveys, visual encounter surveys, point transect counts, and semi-structured questionnaire surveys, under stratified/systematic random sampling frameworks. Indices of abundance were calculated for two sampling seasons (summer/dry and post-monsoon), while kernel density and Maxent algorithms helped generate heat maps and ecological niche models highlighting high diversity areas, fire-prone zones, and areas invaded by alien weeds.

Results:
103 tree (*Fabaceae* most diverse), 33 herpetofauna, about 200 bird, and 27 mammalian species (*Lepus nigricollis, Axis axis* most abundant) were documented from the IIZ, including species of conservation concern (e.g., *Dalbergia latifolia, Gyps bengalensis, Tetracerus quadricornis, Canis lupus pallipes*). Heat maps and ENM outputs inform the siting of 124 mitigation/wildlife passage structures (total 9.54-km length, or 26.27% of proposed alignment, provisional). *Sus scrofa, Boselaphus tragocamelus* primarily contributed to perceived negative human-wildlife interactions.

Conclusion:
Despite anthropogenic pressures, the landscape retains diverse floral and faunal assemblages, which are threatened by the planned linear intrusion. Should the proposed greenfield railway be objectively demonstrated as unavoidable, implementation of mitigation measures informed by multi-season wildlife studies, and their regular monitoring through inclusive, transparent mechanisms are key towards minimising negative ecological/social impacts.

Project Title:
Preparation of integrated wildlife action plan comprising of mitigation and compensating measures with landscape approach of entire forest area in Hazaribagh Wildlife Forest Division, Hazaribagh West Forest Division and Koderma Forest Division in the impact zone of the Koderma Detour of DFCCIL project

Principal Investigator(s):
Dr. G.V. Gopi
Dr. J.A. Johnson, Dr. Abhijit Das,
Dr. Navendu Page, Dr. Lallianpuii Kawlni
Collaborator agencies:
Department of Forest,
Environment & Climate Change,
Government of Jharkhand;
Ministry of Railways, Government of Bharat

Researcher(s):
Dipak Anand, Priyanka Das, Rohit R.S. Jha (Senior Project Associates); N. Abhin, Aruna Rath, Avinash Yadav, Ajit Sahu (Project Associates-I); Nonita Rana (Research Intern); Dr. Frank SJD, Dr. Sumit Arya, Er. P. Manikandan, Alex Jacob, Swastik Padhy, Sibasish Sahoo, Suvam Kanungo, Abhishek Singh, Gitima Das, Roshme Borgohain, Chirag Vassa, Stanzin Zangmo, Akash Sai (former researchers)

Funding Agency:
Dedicated Freight Corridor Corporation of India Limited (DFCCIL), Ministry of Railways

Project Duration:
November 2021 to October 2023

Key Words:
Linear infrastructure, habitat fragmentation, railway mitigation, impact ecological assessment, sustainable transportation

Twitter Handles:
@RailMinIndia, @dfccil_india, @JharkhandCMO, @JharkhandVan, @nAVEnaturalist, @Avinashyadv95, @Abhintothewild, @AlexJacob11, @Unquitesoul, @RoshmeBorgohain, @Nemophile_GD, @stanzin_zaangmo, @NonitaRana04, @rrs_jha, @lalanikawlni, @jajohny2013, @gopigv

Tweet:
#DFCCIL's #linearinfrastructure #EDFC through #Jharkhand's forests will adversely impact native wildlife/habitats. Our research at #ARS2023 emphasises that #ComprehensiveEcologicalAssessments with regular, inclusive monitoring must to reduce damage.

Project Title:
Assessment and monitoring of climate change effects on wildlife species and ecosystems for developing adaptation strategies in the Indian Himalayan region

Principal Investigator(s):
Shri Virendra R. Tiwari
Dr. S. Sathyakumar
08 Co-PIs

Researcher(s):
Project Scientist (1),
Senior Project Associates (2),
Senior Project Fellows (3),
Junior Project Fellows(2),
Project Affiliates(2),
Project Assistants (3)

Funding Agency:
Department of Science and Technology, Govt. of India

Project Duration:
22-12-2021 to 21-12-2026

Keywords:
West Kameng basin, multi-taxa, distribution, phenology, decision support system

Twitter Handles:
@moefcc, @wii_india, @moefcc, @wii_india, @Vineet_Climate, @DST

Tweet:
: Unlocking the secrets of Himalayan wildlife: NMSHE bridges Phases I and II for climate adaptation in the Indian Himalayan Region. #ClimateChange #Himalayas #Conservation"

Assessment and monitoring of climate change effects on wildlife species and ecosystems for developing adaptation strategies in the Indian Himalayan Region: Bridging NMSHE Phase I and II

Dr. Vineet K. Dubey

Aim:
The National Mission for Sustaining the Himalayan Ecosystem (NMSHE), one of India's eight national missions under the National Action Plan on Climate Change (NAPCC), aims to conserve wildlife in the Indian Himalayan Region (IHR) while promoting sustainable development and addressing climate change. In its second phase (2021-2026), NMSHE Task Force IV expands upon Phase I (2015-2019) research to better comprehend climate change impact on Himalayan wildlife.

Location:
The long-term monitoring study areas in Phase I focused on three major river basins-Beas (Himachal Pradesh) in north-west, Bhagirathi (Uttarakhand) in west and Teesta (Sikkim) in eastern Himalaya. The Phase II expands the geographic scope of work by including West Kameng basin (Arunachal Pradesh).

Methods:
Standardized methods established in Phase I, including kick netting for freshwater insects, time-constrained photographic documentation for Lepidopterans, visual encounter surveys for herpetofauna, cast and drag netting for Ichthyofauna, mist netting for birds and camera trapping for mammals were used in the West Kameng basin (elevation 349-5600 masl) from December 2022 to August 2023.
Additionally, ongoing monitoring of soil respiration at established long-term monitoring sites is being continued through 'Open Top Chamber' experiments. Data were consolidated for selected basins of IHR, enabling the development of a web-based decision support system (Wb-DSS),

Results:
The survey documented 16 mammal, 8 fish and 82 Lepidopteran species besides 46 macroinvertebrate families. In continuation with understanding the microclimatic preferences of indicator ectotherms, the *Amolops sp.* was chosen, and was recorded with a mean body temperature of 18.2°C was across elevations, ranging from 13.3°C to 21.1°C. Long-term monitoring (2016-2023) of *Schizothorax richardsonii gonad* weight to somatic weight ratios ranged from a peak of 6.07 in November to a low of 0.14 in February, aligning with western Himalayan rivers' trends. The Phase I and Phase II data are being compiled to develop a 'Web-based Decision Support System' (WbDSS) to inform policy decisions for wildlife conservation under climate change.

Conclusion:
The study establishes baseline patterns for different taxa in west Kameng. Long-term monitoring of species' phenology, distribution and mesocosms offers insights into environmental anthropogenic, and climatic impacts on Himalayan wildlife.

A safe place to cross the road: Use of crossing structures by wildlife in a tiger landscape and implications for multi-species road impact mitigation

Akanksha Saxena

Aim:
Crossing structures (CS) for wildlife are commonly used measures to mitigate the barrier and mortality effects of linear infrastructure. However, information on CS use by wildlife in the global tiger range is scarce, potentially limiting the uptake of such measures in the region with rapidly expanding road networks. Our study attempts to fill this lacuna through long-term monitoring of India's first dedicated wildlife CS on roads.

Location:
We monitored nine CS on National Highway 44 (NH 44) that passes through the Pench Tiger Reserve (PTR), Maharashtra. The highway also intersects an important tiger corridor, threatening wildlife conservation by causing animal mortality and creating a barrier to animal movement from PTR, which is a tiger source in the landscape. The CS measure 50-750 m in length and are 5 m high, and were built during the widening of the highway.

Methods:
We deployed camera traps on supporting pillars of all CS in March 2019, and downloaded the data monthly. We analysed camera trap data to examine patterns of use of CS by wildlife. Specifically, we assessed species richness and factors affecting variation in richness between CS using generalised linear mixed models (GLMMs). We analysed patterns of temporal wildlife activity overlap between different sites and human activity using the coefficient of overlap (Δ). We also assessed variation in relative rates of CS use by wildlife with remotely-sensed and field-collected variables through GLMMs.

Results:
Factors affecting use of CS varied in context of mammal behaviour. Notably, proximal vegetation cover determined greater use by prey and small mammals, and human activity decreased diurnal activity by most species. While CS width influenced species differently, larger structures had highest species richness and accommodated use by more tiger individuals.

Conclusions:
The monitoring results demonstrate acceptance of CS by wildlife, and could potentially influence uptake by development agencies and policy-makers. In the absence of long-term monitoring data on use of CS in the global tiger range, our study provides information pertinent to CS design, dimensions and management in these regions.

Project Title:
Long-term monitoring of wildlife underpasses on National Highway 44 passing through Pench Tiger Reserve, Maharashtra

Principal Investigator(s):
Dr. Bilal Habib

Researcher(s):
Akanksha Saxena, Project Scientist

Funding Agency:
Maharashtra Forest Department

Project Duration:
2019 - ongoing

Key Words:
Mitigation, linear infrastructure, monitoring, effectiveness, mammals

Twitter Handles:
@akadarj, @wildwithwolves, @ntca_india, @MahaForest, @MahaPenchTiger

Tweet:
How did the tiger cross the road? @akadarj answered these questions and more, in her talk on the use of wildlife crossing structures on NH 44 passing through Pench Tiger Reserve. The CS monitoring is now in its 5th year.

Project Title:
Promoting community participation in conservation and conflict resolution in the fringe villages of Kaziranga Tiger Reserve, Assam through ecodevelopment

Principal Investigator(s):
Dr. Ruchi Badola
Dr. S.A. Hussain

Researcher(s):
Project Fellow (Socio-economics)

Funding Agency:
National Tiger Conservation Authority (NTCA)

Project Duration:
2019-2024

Coherence of local institutions in securing people-park interface around Kaziranga Tiger Reserve, Assam

Manisha Ashraf

Aim:

Local institutions play an important role in embedding rules that organize interactions, assign roles and rights, and guide human behaviours with the potential to affect conservation, from local stewardships to gazetted PAs. With a shift from the "fences and fines" approach, strengthening social capital around PA's have been prioritised. The study aims to identify the perception, and aspirations explaining the action and motivation of the local actors in strengthening people-park relationship.

Location:

There are around 184 villages situated within the zone of influence of the Kaziranga National Park. Local institutions namely; Village Defence Party (VDP), Eco-development Committee (EDC) and Panchayati raj institutions operate in this landscape.

Methods:

The study draws on a social–psychological model, the 'Theory of Planned Behaviour'. Underpinned by the grounded theory method, we conducted key informant interviews, focus group discussions and participant observation with 50 VDPs, 31 EDCs and 22 village councils selected through purposive sampling. To construct meaning from unstructured interviews, we deployed a three-phase coding method. Meaningful concepts like wildlife, livelihood, vulnerabilities etc. which focused on emergent themes were identified into 388 open codes. It was refined and aligned with 55 axial codes(categories) and streamlined into 19 cohesive themes indicating conceptual understanding.

Results:

While only 32% of VDP respondents possessed a positive attitude towards the monthly honorarium provided by government, there was no unfavourable appraisal of the behaviours in question or significant difference in rendering flood monitoring duty to prevent accidental animal death, interrogating unknown persons entering fringe villages at night and stringent vigilance against village crimes ($R2 = 0.01$). EDC's intervention is inclined towards gender inclusive livelihood enhancement in 14 aspects. Scepticism towards EDC as a government agency to acquire village land is common. The village councils highlighted vulnerable livelihood due to crop depredation and, apprehension of eviction due to eco-sensitive zones as a deterrent to positive people-park relationship.

Conclusion:

The subjective norm and degree of perceived behavioural control are influenced by the sense of belongingness towards Kaziranga. Proper guidance to EDC in fund utilisation, improved honorarium for VDP and multi-stakeholder awareness programme is suggested.

Keywords:
NA

Twitter Handles:
@moefcc, @wii_india, @ManishaAshraf, @RuchiBadola2, @SyedAinulHussa2

Tweet:
Village Defence Party, Eco-development Committee and village council are three important local institutions in Kaziranga landscape which plays a pivotal role in securing the people-park interface

Mangrove vegetation response to the coastal uplift and subsidence caused by 2004 Tsunami in the Archipelago of Andaman and Nicobar, India

Anoop Raj Singh

Aim:
The topographic changes due to 2004 earthquake triggered a massive regime shift in the mangrove ecosystem across the Andaman and Nicobar Islands (ANI). Mangroves either experienced reduced tidal flooding due to coastal uplift (max. 1.4 m in North Andaman) or increased tidal flooding due to coastal subsidence (max. 3 m in Great Nicobar). These changes have provided an opportunity to study the impacts of sea level change on the mangrove ecosystem. We aimed to understand the immediate and long-term responses of mangrove vegetation to the change in relative sea levels across the Andaman and Nicobar Islands.

Location:
The study was conducted across the Andaman and Nicobar Islands that experienced gradient of coastal uplift (US) and coastal subsidence (SS). Mangroves in the Andaman and Nicobar Islands are among the species rich and luxuriant vegetation in India. ANI is dominated with fringing mangroves, which are different from the deltaic mangroves dominating in the mainland India coast.

Methods:
Linear transects of varying lengths (250 – 800 m) with multiple vegetation plots of 10 x 10 m sq. at ~50m distance representative of the landward zone, mid-zone, and seaward zone were established to study the vegetation patterns.

Results:
A total of 836 plots (US=342, and SS=494) at 53 sites (US=22, and SS=31) across ANI were established. We recorded high species richness in SS (n=31), compared to US (n=19). The tree density/ha in the uplift site was 324/ha, while it was nearly three times in subsided site 984/ha. *Avicennia marina* (33%), and *Rhizophora mucronata* (28%) was most abundance species in US sites, while *R. apiculata* (36%), and *Ceriops tagal* (14%) was most abundance in subsided sites. The species diversity and composition among the US and SS have varied significantly ($p<0.001$).

Conclusions:
We found that the species level responses to the sea level change have significantly influenced the site level recovery potential of the mangrove forest. Species level traits (eg. Propagule size) are also an important driver of mangrove colonization in the new habitats created after the shift in coastal lines. Monitoring mangrove succession in these novel environmental setting would be critical to understand the long-term species competition and community dynamics.

Project Title:
Mangrove response to sea level change along a gradient of tectonic subduction: A multi-disciplinary approach

Principal Investigator(s):
Dr. Nehru Prabakaran

Researcher(s):
Mr. Anoop Raj Singh
(Project Associate II)
Mr. Thrumurugan V
(Project Associate II)

Funding Agency:
Department of Science and Technology, Govt. of India

Project Duration:
2018-2023

Key Words:
9.3 Mw earthquake, new intertidal area, mangrove recovery, Succession, Sea level rise, Sea level drop

Twitter Handles:
@moefcc, @wii_india, @moefcc, @wii_india, -@nehrutp @AnoopRajSingh23 @thiru771 @AndamanForests @IndiaDST @dst_inspire

Tweet:
@AnoopRajSingh23 presenting an overview of #mangrove recovery and response to the coastal uplift and subsidence caused by #2004 Sumatra Andaman earthquake across #Andaman and Nicobar Island.

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