

A stylized illustration of a leopard with a tan and black spotted pattern, walking across a thick, dark brown tree branch. The leopard is facing right, with its tail extending to the left. The background is plain white.

IARS  
2023

16<sup>th</sup> INTERNAL ANNUAL  
RESEARCH SEMINAR

12 - 14 SEPTEMBER, 2023

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PROGRAMME & ABSTRACTS





**16** INTERNAL ANNUAL  
RESEARCH SEMINAR

PROGRAMME  
& ABSTRACTS

IARS  
2023





IARS 2023

# PROGRAMME

# Programme

## SEMINAR CHAIRPERSONS

Sh. B. C. Choudhury & Sh V. K. Uniyal

### INAUGURAL SESSION

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09:00 - 09:05	Welcome	<b>Dr. Bitapi C Sinha</b>
09:05 - 09:15	Remarks by Dean, FWS	<b>Dr. Ruchi Badola</b>
09:15 - 09:25	Inaugral address by Director, WII	<b>Shri Virendra Tiwari</b>

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### DAY 1: 12th September, 2023

#### Technical Session – I: CARNIVORE ECOLOGY

**Chair** : Prof. Qamar Qureshi  
**Co-Chair (s)** : Dr. Salvador Lyngdoh  
**Session Facilitator** : Dr. Shikha Bist

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09:30-09:40	Connecting the clouds: the analysis of clouded leopard connectivity across its distribution range in North-East India	Tribhuwan Singh
09:40-09:50	Under the shadow of Big Brother: Leopard densities across gradient of tiger densities in Vidarbha Landscape	Kanishka
09:50-10:00	Individuality Matters: Learnings from a tiger translocation experiment	Anubhuti Krishna
10:00-10:10	Cost of prime realty: Survival of tiger cubs under the influence of high- turnover and density	A. Krishnan
10:10-10:20	Readiness for Tiger Re-introduction in Buxa Tiger Reserve:A Situation Analyses	Ankit Thakur
10:20-10:30	Interaction of large carnivores in Melghat Tiger Reserve	Jaydeep Patil
10:30-10:40	Silent Strides: Mapping Carnivore and Ungulate Distribution in the semi-arid regions of Karnataka	Basavaraj Mulage
10:40-11:00	Discussion and comments of Chair and Co-chairs	
11:00-11:30	Tea break	

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## Technical Session – II: CONSERVATION & DEVELOPMENT

**Chair** : **Dr. Gopi G.V.**  
**Co-Chair (s)** : **Dr. Abhijit Das**  
**Session Facilitator** : **Akanksha Saxena**

11:30-11:40	Framework for strategizing animal crossing structures in roads through Open Natural Ecosystems	Ashish Jangid
11:40-11:50	Paving the way:Wildlife-friendly measures along the proposed highway in the Rajaji Tiger Reserve	Aman Bhatia
11:50-12:10	Mitigating the impacts of railway line doubling on biodiversity: a case study of Mollem National Park, Goa	Niket Alashi
12:10-12:20	Tracks of Harmony:Wildlife Movement and Mitigation measures along the Haridwar-Dehradun Railway line	Aparna Sunil
12:20-12:30	Understanding the impacts of mining in Chandrapur district on landscape integrity for tiger conservation	Neha Yadav
12:30-12:50	Discussion and comments of Chair and Co-chairs	
12:50-14:00	Lunch	

## Technical Session – III: HUMAN DIMENSIONS

**Chair** : **Dr. Ruchi Badola**  
**Co-Chair (s)** : **Dr. C. Ramesh**  
**Session Facilitator** : **Dr. Shivani Barthwal**

14:00-14:10	Fear and Fascination: Exploring communities perceptions, attitude, Knowledge and Practices surrounding snakes in Nicobar Archipelago	Jyoti Nagarkoti
14:10-14:20	Connecting people and river to realize the Arth Ganga	Sneha Sharma
14:20-14:30	Living at the edge - carnivores in human dominated landscape	Sajid Reza
14:30-14:50	Discussion and comments of Chair and Co-chair	

## Technical Session – IV: TECHNOLOGY IN CONSERVATION

**Chair** : **Dr. K. Ramesh**  
**Co-Chair (s)** : **Dr. Abhijit Das**  
**Session Facilitator** : **Dr. Bharti Arora**

14:50-15:00	Effective mapping of seagrasses using remote sensing technologies in Indian waters	Sohom Seal
15:00-15:10	From Data to Conservation: Mapping distribution of 9 Endangered Mammal and 3 endangered bird species in India	Sneha Pandey
15:10-15:20	Harmony in habitats: Mapping the vital elephant corridors of India	Udhay Raj
15:20-15:30	Identification of behavioural states from accelerometer data of tigers	Anjali Thapliyal
15:30-15:40	Modelling habitat suitability and movement corridors for Tigers and Rhinoceros in the Transboundary Terai Arc Landscape	Manisha Bishnoi
15:40-15:50	An approach for developing unified protocol for monitoring elephant populations	Charanjot Kaur
15:50-16:10	Discussion and comments of Chair and Co-chair	
16:10-16:40	Tea break	



## DAY 2: 13th September, 2023

### Online Session – SACON

Chair : Dr. S. Sathyakumar  
Co-Chair (s) : Dr. B. S. Adhikari  
Session Facilitator : Dr. Indraneil Mondal

09:30-09:40	Determining the effects of socio-ecological forces shaping striped hyaena ( <i>Hyaena hyaena</i> ) population in the Western part of Tamil Nadu, southern India	Ashish Kumar
09:40-09:50	Assessing human-peafowl conflict and developing an action plan to reduce the conflicts in select zones of Tamil Nadu	Kishore R
09:50-10:00	Impact of invasion of invasive species on habitat use of Gaur in Bandipur Tiger Reserve, Karnataka	Subhadra Barik
10:00-10:10	Assessing anthropogenic threats to large carnivore population in the Western Ghats part of Tamil Nadu, southern India	Milda David
10:10-10:20	Modeling the effect of top predators and habitat on the distribution of mesocarnivores in large-carnivore landscapes of India and central Europe	Ashish Kumar
10:20-10:30	Taxonomic characterization of select Galliformes of India using feather morphometrics and DNA for application in wildlife forensics	Bhawani Sabat
10:30-10:40	Disentangling the Functional role of Vertebrate Scavengers at carcass dump sites in the Western Aravalli Hills of Haryana	Hitesh Kumar
10:40-11:00	Status, distribution and conservation of Indian swiftlet in Maharashtra	Dhanusha Kawalkar
11:00-11:30	Tea	
11:30-11:40	Power lines and birds: Recommendations for anti-collision measures with respect to Thane Creek Flamingo Sanctuary, Mumbai, Maharashtra	Dr. Baburao, G.
11:40-11:50	The current status of habitat quality and prey of White-bellied Heron ( <i>Ardea insignis</i> ) in Eastern Arunachal Pradesh	Kavin D.
11:50-12:00	The Cormorant Oceanography Project: Exploration of the potential areas for tagging cormorant species along the east coast of Tamil Nadu, India".	Dr. Mahendiran
12:00-12:10	A non-invasive approach to understanding the habitat use, activity regime, and movement ecology of Indian Rock Python, <i>Python molurus</i> from two select locations in India	Dr. Aditi Mukherjee
12:10-12:20	Assessment of fish diversity in Moyar river, Tamil Nadu	Dr. Vidyadhar Atkore

12:20-12:30	Restoration of holding ponds in Navi Mumbai Municipal Corporation area	Dr. Goldin Quadros
12:30-12:40	Integrated Management Plan for Human-Blackbuck Conflict in Narayanpet District, Telangana	Bharti Arora
12:40-12:50	Population status and habitat use by Great Indian Bustards in Siruguppa, Karnataka	Dr Kumara HN
12:50-13:10	Discussion and comments of Chair and Co-chairs	
13:10-14:00	Lunch	

#### Technical Session – V: HERBIVORE

**Chair** : **Dr. Bilal Habib**  
**Co-Chair (s)** : **Dr. Lallianpuii Kawlni**  
**Session Facilitator** : **Dr. Lakshminarayan**

14:00-14:10	Moving Towards Species Recovery: Gaur Reintroduction in Sanjay-Tiger Reserve, Madhya Pradesh	Ritesh Vishwakarma
14:10-14:20	Elephant Reserve in Changing Landscape	Akriti Singh
14:20-14:30	Hyper-Dispersal and Exploration by Reintroduced Gaur ( <i>Bos gaurus</i> ) in Sanjay Tiger Reserve, Madhya Pradesh	Bhaskar Bhandari
14:30-14:50	Discussion and comments of Chair and Co-chair	

#### Technical Session – VI: MOLECULAR ECOLOGY

**Chair** : **Dr. S. K. Gupta**  
**Co-Chair (s)** : **Dr. Samrat Mondol**  
**Session Facilitator** : **Dr. Ajith Kumar**

14:50-15:00	Genetic insights of the captive elephant across India: a preliminary assessment	Ankit Pacha
15:00-15:10	Phylogeography and demography history of leopards ( <i>Panthera pardus fusca</i> ) in India based on mitochondrial DNA	Supriya Bhatt

15:10-15:20	Migration is essential: functional connectivity and movement patterns of swamp deer along the upper Ganges	Sohini Saha
15:20-15:40	Discussion and comments of Chair and Co-chair	
15:40-16:00	Tea break	

### Technical Session – VII: AQUATIC ECOLOGY

**Chair** : **Dr. JA Johnson**  
**Co-Chair (s)** : **Dr. Nehru Prabhakarn**  
**Session Facilitator** : **Dr. Vineet Dubey**

16:00-16:10	Understanding the nutrient dynamics across the recently established Dugong Conservation reserve in Tamil Nadu	Srabani Bose
16:10-16:20	Spatial diversity of seagrass associated macrobenthos in Gulf of Kutchh, Gujarat	Prachi Hatkar
16:20-16:30	Preliminary study on distribution pattern of Endangered Arabian Sea Humpback Whale based on Fishery folk survey	Sreelekha Suresh
16:30-16:40	Ecotoxicological status of select Indian Rivers	Sagar Sharad Chawan
16:40-16:50	Unveiling the importance of seagrass meadows as fish nurseries in Gulf of Man- nar, Tamil Nadu	Chinmaya Ghanekar
16:50-17:00	Lesser known fauna: Seagrass-associated macrobenthos in a tropical insular system	Swapnali Gole
17:00-17:20	Discussion and comments of Chair and Co-chairs	

## Day 3: 14th September 2023

### Technical Session – VIII: AVIAN ECOLOGY

**Chair** : **Dr. R. Suresh Kumar**

**Co-Chair (s)** : **Dr. Sutirtha Dutta**

**Session Facilitator** : **Dr. Bipin CM**

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09:30-09:40	Tracking a globally threatened scavenger: Unraveling the movement patterns of White-rumped Vulture in a breeding habitat of Kangra, Himachal Pradesh.	Malyasri Bhattacharya
09:40-09:50	From West to East: Determining Population Variations of a Long-distance Migrant Barn Swallow <i>Hirundo rustica</i> breeding in the Himalaya	Amarjeet Kaur
09:50-10:00	Morphological adaptations in the house sparrow along an elevational gradient in the Himalaya	Renu Bala
10:10-10:20	Discussion and comments of Chair and Co-Chair	

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### Technical Session – IX: HABITAT ECOLOGY

**Chair** : **Dr. B.S. Adhikari**

**Co-Chair (s)** : **Dr. Navendu Page**

**Session Facilitator** : **Rahul Kumar**

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10:20-10:30	Assessing Impacts of Experimental Warming on Respiration Rates and Plant Productivity in Western Himalaya	Deepali Bansal
10:30-10:40	Distribution pattern of invasive alien plants and impact of <i>Lantana camara</i> on soil and vegetation in Western Rajaji Tiger Reserve, Uttarakhand	Sipu Kumar
10:40-11:00	Discussion and comments of Chair and Co-chair	
11:00-11:30	Tea Break	

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## Technical Session – X: MIXED BAG

**Chair** : **Dr. Bivash Pandav**  
**Co-Chair (s)** : **Dr. Vishnupriya K.**  
**Session Facilitator** : **Sh. Bitpuan Baruah**

11:30-11:40	Aspects of body temperature variation of stream Frog Genus Amolops across elevational bands in West Kameng Basin of Arunachal Pradesh	Krishnendu Banerjee
11:40-11:50	Population status and stream covariates influencing the abundance of anurans in western Himalayan landscape of Himachal Pradesh.	Saurav Chaudhary
11:50-12:00	Analyzing the Element-Specific Results of India's Tiger Reserves through Four Management Effectiveness Evaluation Cycles	Ananya Das
12:00-12:20	Discussion and comments of Chair and Co-chairs	

## Technical Session – XI: CLIMATE CHANGE

**Chair** : **Dr. S. Sathyakumar**  
**Co-Chair (s)** : **Dr. Amit Kumar**  
**Session Facilitator** : **Dr. Shivam Shohtriya**

12:20-12:30	Journeying across Himalayan Riverscapes: Investing Freshwater fauna, Biological Patterns and Processes under Changing Climate	Meghavi Purohit, Himangshu Bora
12:30-12:40	Weathering the Change: Insights into Himalayan Marmot movement pattern and Habitat use	Prasad Tonde
12:40-13:00	Discussion and comments of Chair and Co-chair	
13:00-13:20	Vote of Thanks & Comments	Dr. Bivash Pandav





IARS 2023

# ABSTRACTS

**Project Title:**

PAN India Assessment and monitoring of Endangered species under the IDWH - Clouded Leopard

**Principal Investigator(s):**

Dr. Bilal Habib; Dr. Gopi G.V.

**Researcher(s):**

Srishti Gwal (Project Scientist-I),  
Tribhuwan Singh (Project Associate-I),  
Rameshwar Ghade (Project Associate-I),  
Daniel Miranda (Project Associate-I),  
Burney Rosetta (Project Associate-I),  
Azam Khan (Project Associate-I),  
Kunal Gokhale (Project Associate-I)

**Funding Agency:**

Ministry of Environment, Forest and Climate Change (MoEFCC)

**Project Duration:**

December 2022-December 2024

**Keywords:**

Corridor connectivity, Habitat suitability, Least-cost pathways, Pinch-points, Resistance surface

**Twitter Handles:**

@moefcc, @wii\_india, @bhlab\_india, @wildwithwolves, @gopigv, @moefcc, @wii\_india, @SrishtiGwal, @thetreehoovana, @ghade\_rameshwar, @DanielMira47627, @BurneyRosetta, @azamkhan651612, @kunalgokhale08

**Tweet:**

Analysis of potential habitat distribution and corridor connectivity of clouded leopard from the Northeastern parts of India was presented. The study intends to identify the conservation priority areas and corridors in this region. #cloudedleopard

# Connecting the clouds: the analysis of clouded leopard connectivity across its distribution range in North-East India

-Tribhuwan Singh

**Aim:** The unprecedented expansion of human activities poses a grave threat to the survival of globally threatened clouded leopard (*Neofelis nebulosa*). This has led to a rapid deterioration and loss of their natural habitats, placing their existence in jeopardy. Absence of information on the distribution and connectivity for the species within the North-Eastern landscape presents an obstacle to the implementation of effective conservation measures. The present study aims to identify the distribution of potential habitats of the species and connectivity among them.

**Study area:** The study was performed in North-Eastern landscape of India which mainly comprises of evergreen broad leaf, evergreen needle leaf, and mixed forest type. The region holds promise as a suitable habitat for the species.

**Methodology:** Habitat suitability of the species was modelled using presence-only model (MaxEnt) whereas the corridor connectivity was modelled using core habitat area and resistance surface raster in Linkage Mapper tool.

**Results:** MaxEnt model predicted ~7% of the total North-Eastern landscape under highly suitable (potential) habitat for the species and rest of the area falling in moderate to low suitable habitat. Major factors identified were distance from the protected area, human population density, percent forest cover, and forest loss. This analysis resulted into 30 core habitats which were treated as nodes in connectivity analysis. These core habitats were connected through total least-cost path (LCP) of length approx. 5,520 km. Centrality analysis of LCPs suggested value between Fakim and Puliebadze WLS was highest (160.5). Several pinch-points were observed in the adjacent pairs of the corridors in pair-wise analysis whereas high values of cumulative pinch-points were observed between Dehing Patkai-Fakim WLS, and Namdapha NP-Fakim WLS.

**Conclusion:** These regions have pronounced effect of human dominated activities which restrict the movement of the species. Pinch-points on the landscape peripheries showed areas important for maintaining the trans-boundary movement. These areas are vital for sustaining the overall connectivity of the population across the landscape. Further habitat degradation in and around the pinch-points could significantly disrupt it.



# Under the shadow of Big Brother: Leopard densities across the gradient of tiger densities in Vidarbha Landscape

-Kanishka

The sympatric predators like tigers (*Panthera tigris tigris*) and leopards (*Panthera pardus fusca*) in the same geographic area facilitate their coexistence through the implementation of diverse strategies, including spatial segregation, temporal partitioning, and divergent prey preferences.

**Aim:** This study aims to investigate the spatial and temporal dynamics of leopard densities in relation to varying tiger densities across the Vidarbha landscape. It postulates that the presence of tigers exerts a discernible influence on spatiotemporal pattern of leopards and while also highlighting the crucial role of habitat covariates.

**Location:** The study was conducted in Tadoba Andhari (TATR) and Navegaon – Nagzira Tiger Reserve (NNTR) in Vidarbha Landscape, Maharashtra. TATR & NNTR falls within the category of southern tropical dry deciduous forest.

**Methods:** Camera trap photo captures were used for tigers and leopards to determine their spatio-temporal patterns of co-occurrence. Concurrently, habitat covariates were integrated, such as Normalised Difference Vegetation Index (NDVI), prey relative abundance (RAI), elevation, distance to roads, settlements, and water. Density surface of tiger and leopard was performed using Spatially Explicit Capture Recapture (SECR) framework with the habitat covariates likely believed to influence their densities. A quantile regression analysis was conducted to attain the relationship between the densities. We estimated the temporal overlap between these two sympatric predators and their principal prey using the “camtrapR” package in R (v. 3.1.3).

**Results & Conclusion:** To optimize result, we divided the study area into high and low tiger density categories based on the best fit (SECR Heterogeneity) model; TATR with density 6.60 ( $\pm 0.71$ ) per 100 km<sup>2</sup> as high tiger density area, and NNTR with 0.68 ( $\pm 0.2$ ) per 100 km<sup>2</sup> as low tiger density area. Leopard densities for these sites were 9.74 ( $\pm 0.86$ ) and 10.63 ( $\pm 1.24$ ) per 100 km<sup>2</sup> respectively. Quantile regression analysis between both predators in low tiger density area showed that leopard density inclined at lower quantiles and stabilized at higher quantiles, while in high tiger density area it inclined exponentially with the quantiles. This is likely driven by the habitat heterogeneity and presence of good quality habitat. The findings underscore the complexity of predator interactions and emphasize the need for a finer level of study to explore the intricacies of this segregation further.

## 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, Capt. Dr. Parag Nigam, Dr. Jitendra Ramgaokar (CF & FD TATR), Jayrame Gowda (FD NNTR), Nandkishore Kale (DD Core TATR), Pawan Jeph (DD NNTR)

## Researcher(s):

Kanishka (Project Associate I), A. Krishnan (JRF), Suman Koley (JRF), Jaydeep Patil (JRF), Advaita Ravindran (JRF), Anjali Thapliyal (Project Associate I), Sajid Reza (Project Associate I), Khadija Sultana (Project Associate I), Akshayi AS (Senior Project Associate), Shaheer Khan (Senior Project Associate).

## Funding Agency:

Maharashtra Forest Department, Govt. of Maharashtra

## Project Duration:

2019 – 2029

## Keywords:

SECR, spatiotemporal overlap, sympatric species, Abundance

## Twitter Handles:

@moefcc, @wii\_india, @moefcc, @wii\_india, @bhlab\_india, @wildwithwolves, @paragnigam09, @MahaForest @Kanfeline\_

## Tweet:

In the realm of the wild, where tigers roam, leopards silently thrive. An exploration in the hidden world of spotted shadows in Vidarbha. #WildlifeWhispers #TheJungle-Book #TigerAndLeopardTales #IARS2023

**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, Capt. Dr. Parag Nigam, Shri Jayaram Gowda R, Shri Pawan Jeph

**Researcher(s):**

Anubhuti Krishna (Project Associate), Kanishka (Project Associate), Rakesh Ahuja (Biologist, Bramhapuri Forest Department), Akshayi AS (Senior Project Associate)

**Funding Agency:**

Maharashtra Forest Department, Govt. of Maharashtra

**Project Duration:**

2019 - 2029

**Keywords:**

Space-use, dispersal, movement-metrics, stepping-stone habitats

**Twitter Handles:**

@moefcc, @wii\_india, @wildwithwolves, @paragnigam09, @bhlab\_india, @Maha-Forest

**Tweet:**

Individuality Matters: Learnings from the Tiger Translocation Experiment in Navegaon-Nagzira Tiger Reserve, Maharashtra #iars2023 #wii #tigerconservation #tiger-translocation #spatialecology

# Individuality Matters: Learnings from a Tiger Translocation Experiment

-Anubhuti Krishna

**Aim:** Navegaon-Nagzira Tiger Reserve (NNTR) reported a total of 12 adult tigers as per the annual population estimation conducted in the year 2022. This population was found to have a male-biased sex ratio with little recruitment of cubs over years. A simultaneous assessment of the carrying capacity of tigers revealed that NNTR had the potential to host at least 20 adults of the species. With this backdrop, the proposal for the conservation translocation of 5 female tigers to NNTR, aiming to augment the existing population and understand the differential individual patterns of movement post-translocation, came into effect.

**Location:** NNTR, situated in eastern Maharashtra, has a total area of 1897.6sq.km and holds a vital position within the central Indian tiger meta-population, acting as a stepping-stone corridor within this landscape.

**Methods:** Under the first phase of the translocation program, 2 female tigers were captured (one each from Bramhapuri Forest Division and Tadoba-Andhari Tiger Reserve), collared (Iridium GPS radio-collars, Vectronics) and released (hard release) into NNTR. They were subsequently ground-tracked using VHF signals as well as GPS-satellites. The GPS data was then analysed using R and ArcGIS tools so as to understand the movement patterns of the tigers post-translocation.

**Results:** The two individuals demonstrated patterns of movement greatly varying from each other. While one remained within the boundaries of the Reserve three months post-translocation, the other dispersed to the forest patches of Balaghat, Madhya Pradesh within a similar time frame. An analysis of the movement-metrics and space-use revealed differences between the two individuals as well as between the summer and monsoon seasons, and day and night. The average step-lengths for the two females were 209.9m and 335.8m while the average daily-distances moved were 4.5km and 7.2km respectively. The variogram for the net-squared displacement elucidated the dispersal phase for the latter female.

**Conclusion:** This conservation experiment demonstrated the differential behaviour of individuals post-translocation. It also revealed, in real-time, a functional corridor between NNTR and Balaghat wherein small stepping-stone habitats played a pivotal role in dispersal, thus highlighting the importance of such connecting patches within highly-fragmented central India.

# Cost of prime realty: Survival of tiger cubs under the influence of high-turnover and density

-A. Krishnan

**Aim:** To understand the cub survival rates of two tigresses in core area of Tadoba Andhari Tiger Reserve

**Location:** Tadoba Andhari Tiger Reserve (TATR), Maharashtra

**Methods:** 2 tigresses (T7 & T12) in the core area of TATR were monitored from the year 2014 to 2023 to understand the survival of their cubs with respect to the ability of their mates (Male tigers) to hold their respective territories. Long-term camera trapping along with opportunistic field observations were utilised for this study

**Results:** During the period of study both females gave birth to 5 litters each ranging from 1–5 cubs per litter. Only 2 (both males) out of 13 cubs born to tigress T12 survived till dispersal, while 5 (3 females and 2 males) out of 12 cubs born to T7 survived till dispersal. The number of males within the territory of these 2 females ranged from 2–7 during this period.

**Conclusion:** In a high-density tiger reserve such as TATR, the turnover rate of male tigers in prime areas of the forest is high which leads to high cub mortality due to infanticide. In TATR due to the high tiger density along with high male turnover rate multiple males have been observed to occupy highly or completely overlapping territories in prime areas of the tiger reserve such as areas around Jamni and Pandharpauli lakes, where the females T7 and T12 have their territories, respectively. This leads to high competition between the males for mating with these females. Males kill cubs that are not sired by them so that the females will mate with them and it becomes difficult for the female to protect her cubs from all the males that roam in her territory and provide food to the cubs simultaneously. Due to high competition cubs are also forced to disperse at a very young age which makes them prone to death.

## 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. Jitendra Ramgaokar, Capt. Dr. Parag Nigam, Nandkishore Kale, Kushagra Pathak

## Researcher(s):

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

## Funding Agency:

Maharashtra Forest Department

## Project Duration:

2019 – 2029

## Keywords:

Infanticide, Dispersal, Overlapping Territories, Age, Conservation

## Twitter Handles:

@moefcc, @wii\_india, @moefcc, @wii\_india, @bhlab\_india, @wildwithwolves, @paragnigam09, @MahaForest

## Tweet:

Cost of prime realty: Survival of tiger cubs under the influence of high-turnover and density

**Project Title:**

Augmentation and Long-term Monitoring of Tiger in Buxa Tiger Reserve, West Bengal

**Principal Investigator(s):**

Dr. Ramesh Krishnamurthy

**Researcher(s):**

Ankit Thakur (Project Fellow),  
Shekhar Sarkar (Project Fellow)

**Funding Agency:**

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

**Project Duration:**

March 2018 to March 2026

**Keywords:**

Translocation, Rewilding, Species recovery, Protected area management

**Twitter Handles:**

@moefcc, @wii\_india, - @aryan2142, @kramesh95, @ForestDeptWB

**Tweet:**

Assessing the readiness of tiger recovery program in Buxa Tiger reserve, West Bengal: A Situation Analyses. #Tiger #NTCA #speciesrecovery #iars2023 #wii

# Readiness for Tiger Recovery in Buxa Tiger Reserve: A Situation Analysis

**-Ankit Thakur**

**Aim:** To assess the preparedness for a tiger recovery program based on the completion of phase I (2018-2023) of the project. India has witnessed some exceptional success stories with tiger (*Panthera tigris*) reintroduction, which is a robust method for fostering the long-term recovery of the species.

**Location:** The study was carried out in Buxa Tiger Reserve (BTR) in northern West Bengal, India.

**Methods:** The Tiger augmentation effort was initiated in 2018. Phase I of the project (until March 2023) ensured ceaseless capacity building of the frontline staff in monitoring protocols, gap analysis, and hotspot identification. A systematic camera trapping exercise was conducted for the last four years in succession to assess diversity and abundance indices for future management perspectives. Furthermore, the identification of a micro-core area within the tiger reserve for added protection, identification of the tiger release site, and a continuous augmentation of prey were done. A questionnaire-based survey of villages within the tiger reserve to understand people's perception of the proposed tiger release (phase II) and sensitization is currently underway.

**Results:** There have been occasional tiger movements in BTR, which suggest connectivity with neighboring areas. The relative abundance index of co-predators like leopards is 7.88, dholes 0.24, along with a thriving diversity of mesopredators like clouded leopard, asian golden cat, marbled cat, leopard cat, which signifies other wild prey availability. In 2021, a camera trap captured a tiger in BTR. Wild ungulate density is estimated at 12.17 per km<sup>2</sup> in the tiger reserve and 33.6 per km<sup>2</sup> in the micro core. 124 capacity-building programs were conducted, resulting in the training of 2742 individuals. Habitat characteristics indicate a dense forest cover (semi-evergreen) with a varied level of human disturbances.

**Conclusion:** With continuous prey augmentation along with the existing wild ungulate density, and effective protection by trained staff, BTR is now in the path of tiger recovery through natural colonization and conservation translocation. However, community engagement and strengthening functional connectivity need to be a continuous process to ensure successful outcomes

# Interaction of large carnivores in Melghat Tiger Reserve, Maharashtra, India

-Jaydeep Patil

**Aim:** To understand the interactions between sympatric large carnivores inhabiting a protected area in Vidarbha landscape, Maharashtra

**Location:** Melghat Tiger Reserve, Vidarbha Landscape, Maharashtra, India

**Methods:** Camera trapping was used to collect data from the study site (2768 sq. km.) for the duration of three years (2020 – 22). Analyses were conducted using camtrapR package in R software, which resulted in plotting of activity overlap graphs.

**Results:** Activity overlap graphs were extracted for carnivore species pairs generated from multi-response permutation procedures. The overlap graphs indicated activity periods of each species on a 24h timescale, in comparison to another sympatric carnivore in the region. Thus, 3 graphs were generated for the 3 focal species in the region viz., tiger (*Panthera tigris*), leopard (*Panthera pardus*) and dholes (*Cuon alpinus*), for each of the camera trap sessions. Highest average overlap over the duration of 3 years was observed between tigers and leopards, followed by tigers and dholes, and finally leopards and dholes. Tigers and leopards show high temporal overlap whereas spatial coexistence patterns show variability across the years. Dholes, on the other hand, have shown distinct spatial and temporal segregation from tigers as well as leopards across the duration of study.

**Conclusions:** Tigers, being the apex predator, displayed higher activity in the hour past dusk with little change in their temporal activity patterns across the years. Tigers show a preference towards areas with mountainous terrain which is favoured by prey like sambar and gaur. Leopards avoid territorial overlap with tigers allowing them to be active in the same temporal frame. Dholes are lesser in number and observed pack size is also small in the study site. Dholes avoid Tiger/Leopard territory due to the competition from these predators or because their preferred prey are found in territory different from those of Tiger/Leopard

## Project Title:

Long-term monitoring of tigers, copredators and prey in tiger reserves and other tiger bearing areas of Vidarbha, Maharashtra, India

## Principal Investigator(s):

Dr Bilal Habib, Jayoti Banerjee, Capt. Dr Parag Nigam, Divya Bharati M, Sumant Solanke, Jeykumaran N, Yashwant Bahale

## Researcher(s):

Jaydeep Patil, A. Krishnan, Suman Koley, Advaita Ravindran, Kanishka, Anubhuti Krishna, Sajid Reza, Khadija, Anjali Thapliyal, Shaheer Khan

## Funding Agency:

Maharashtra Forest Department

## Project Duration:

2019 – 2029

## Keywords:

Sympatric carnivores, Vidarbha landscape, carnivore guild composition, large carnivore conservation, population management

## Twitter Handles:

@moefcc, @wii\_india, @bhlab\_india, @wildwithwolves, @paragnigam09, @MahaForest

## Tweet:

Interaction of large carnivores in Melghat Tiger Reserve, Maharashtra, India

**Project Title:**

Ecology and conservation of Major carnivore and ungulates of semi-arid grassland scrub-agro-systems of Karnataka

**Principal Investigator(s):**

Prof. Qamar Qureshi,  
Dr. Vishnupriya Kolipakam,  
Dr. Lallianpui Kawlani

**Researcher(s):**

Dr. Manjari Roy (Project Scientist),  
Basavaraj Mulage, (Project Fellow),  
Chetan C M (Research assistant),  
Ameya Kulkarni (Research assistant)

**Funding Agency:**

Karnataka forest department

**Project Duration:**

2021-2024

**Keywords:**

Grasslands, Occupancy, Interview based survey, Karnataka

**Twitter Handles:**

@moefcc, @wii\_india, @moefcc, @wii\_india, @basava\_mulage, @7beb396124fa459, @aranya\_kfd

**Tweet:**

NA

# Silent Strides: Mapping Carnivore and Ungulate Distribution in the semi-arid regions of Karnataka

-Basavaraj Mulage

**Background & Aim:** Conservation initiatives in India have frequently centered around protected areas and their inhabitants. However, the semi-arid grasslands in India, provide critical habitat for a diverse range of less charismatic species which in turn receive little to no attention in terms of conservation efforts, thus there is paucity of information from these semi-arid grassland inhabitants. The current study aims to understand the distribution of the major carnivores and ungulates in the semi-arid landscape of Karnataka.

**Location:** The study was carried out in the eastern-plains of northern Karnataka within a human dominated landscape.

**Methods:** we designed and employed interview based occupancy surveys to study species distribution across the landscape. We used 25sq km grid to sample across the districts and the data was analysed using single-season occupancy modelling in 'R' using package 'unmarked'.

**Results:** The occupancy estimates for the focal species in in the pilot study were as follows: Indian gray wolf 0.85 (SE 0.02), Bengal fox 0.94 (SE 0.15), golden jackal 0.63 (SE 0.01), striped hyena 0.37 (SE 0.03), leopard 0.19 (SE 0.01), sloth bear 0.21 (SE 0.01), blackbuck 0.39 (SE 0.01), and pangolin 0.13 (SE 0.03). Despite severe anthropogenic pressure, these less charismatic species are surviving in the human dominated landscape by coexisting with humans. At present, analysis of all the three surveyed districts is ongoing.

**Conclusion:** This study will help to understand the distribution patterns of pivotal carnivores and wild ungulates within the human dominated semi-arid expanse of eastern Karnataka, and thus aid in informed conservation decisions

# Framework for strategizing animal crossing structures in roads through Open Natural Ecosystems

-Ashish Kumar Jangid

**Aim:** Linear infrastructures like roads and railways can harm wildlife by fragmenting habitats. However, the conflict between economic development and biodiversity conservation can be managed by strategically placing mitigation measures based on animal movement, space use and collision data, optimizing effectiveness and minimizing costs. Our aim was to prioritize road segments for suggesting right locations of mitigation structures based on surrounding wildlife habitat, connectivity, and vehicle collisions.

**Location:** 63 km stretch of NH11 in Desert National Park, Rajasthan, India.

**Methods:** We assessed connectivity and collision risk for key species (chinkara and desert fox) within 10 km buffer as impact zone to prioritize road segments for mitigation, using vehicle transects (189 km), roadkill surveys (378 km), walk transects (64 km) and camera trapping (829 trap days), combined with information from landscape level Great Indian Bustard surveys from last 10 years. We modelled the connectivity among core habitats of species, identified through ensemble of species habitat use models and circuit approach. We calculated mechanistic and empirical collision probabilities using traversability and logistic models, respectively. We prepared composite priority scores by overlaying connectivity and collision values with encounter rates and selected the top 10 percentile segments. Accounting for animal home ranges, segments within every 5 km for chinkara and every 2 km for desert fox were prioritized for wildlife crossing structures.

**Results:** In total, 478 records of chinkara and 81 of desert fox yielded significant habitat use models (ROCchinkara 0.81; ROCdfox 0.97). Key species' collisions were found to be triggered by the vehicle frequency, proportion of visibility obstruction around the road, habitat connectivity and animal encounter rates. In total, 60 and 78 segments were identified for chinkara and desert fox as priority segments, which were optimized to 11 and 19 segments, respectively.

**Conclusion:** Our research showcases a data-driven strategy for effectively managing infrastructure-wildlife conflicts. This approach holds the potential for preserving wildlife corridors and bolstering landscape connectivity specially in open natural ecosystems, where animal movement is dynamic

## Project Title:

Scientific animal passage and mitigation plan for 62km stretch of Myajlar-Jaisalmer road (NH-11) passing through Desert National Park, Rajasthan

## Principal Investigator(s):

Dr. Sutirtha Dutta, Dr. Malvika Onial

## Researcher(s):

Ashish Kumar Jangid,  
Devendra Dutta Pandey  
(Project Associate II)

## Funding Agency:

National Highway Authority of India

## Project Duration:

13 months

## Keywords:

Linear infrastructure, Chinkara, Desert fox, open grassland, strategic measures.

## Twitter Handles:

@moefcc, @wii\_india, @moefcc, @wii\_india, @ashishjangid22, @devendra15594, @SutirthaDutta82

## Tweet:

Balancing Progress & Preservation!  
Discover how research in Rajasthan's Desert National Park paves way for sustainable development. With data-driven strategies, wildlife habitats are safeguarded #WildlifeConservation #OpenNaturalEcosystem



**Project Title:**

Wildlife Study and Mitigation Plan for Development of 4 Lane Haridwar Bypass Road (Package – 2) passing through Rajaji Tiger Reserve and National Park, Uttarakhand

**Principal Investigator(s):**

Dr Bilal Habib, Dr Parag Nigam

**Researcher(s):**

Mr. Aman Bhatia (Project Associate), Mr. Zehidul Hussain (Principal Project Associate), Dr. Shivam Shrotriya (Project Scientist)

**Funding Agency:**

National Highway Authority of India

**Project Duration:**

04 April 2023- 31 March 2024

**Keywords:**

Conflict mitigation, Conservation management, Elephant, Linear infrastructure, Sustainable development

**Twitter Handles:**

@moefcc, @wii\_india, @moefcc, @wii\_india, @aman\_bhatiaWild, @shivam\_wolf, @thewild\_dodo, @paragnigam09, @wildwithwolves

**Tweet:**

Check out our presentation at the Internal Annual Research Seminar by @wii\_india on wildlife-friendly measures for facilitating large mammal movement in the terai landscape. @NHAI\_Official @moefcc @MORTHIndia #Mitigation #RajajiTigerReserve #wildlife

# Paving the way: Wildlife-friendly measures along the proposed highway in the Rajaji Tiger Reserve

**-Aman Bhatia**

**Aim:** Roads are known to have an adverse impact on wildlife. Therefore, roads crossing through protected areas need to be carefully managed to minimize their negative impact. We present a case study of proposed 4-lane bypass road passing through Rajaji Tiger Reserve (TR), Uttarakhand, India.

**Location:** The study was carried out in the Chilla Range of Rajaji TR and Shyampur Range of Haridwar Forest Division.

**Methods:** We surveyed to assess the wildlife usage of the areas along the proposed road. The study area was divided into two grid systems of 2×2 km<sup>2</sup> for sign-based and 1×1 km<sup>2</sup> for camera-trap-based surveys. Each 2×2 km<sup>2</sup> grid-cell was walked thrice for 2 - 4 km to collect data on species presence. A total of 41 single-sided camera traps, placed in 1×1 km<sup>2</sup> grid-cell, were deployed for 2,353 trap-nights to record the direct presence of the wildlife in the study area. The data was collected during pre- and early-monsoon season (May - July 2023). Data analyses and visualization were done using the 'camtrapR' package in the R program and ArcGIS 10.6.

**Results:** A total of 30 wildlife species were recorded, with spotted deer (n= 5013) and sambar (n= 2419) being the most frequently captured species. Single captures were recorded for goral, Himalayan black bear and Indian pangolin, while sambar, wild boar and elephant were captured in most camera traps. Species of conservation importance, such as elephants, tigers, leopards, and hyenas, utilize the habitat surrounding the proposed alignment of the bypass road. Sign-density maps of the area highlight potential sites where animals are likely to approach the road.

**Conclusion:** The proposed highway will pass underground throughout the major wildlife habitat. However, the entry and exit of the tunnel, where there are important elephant movement pathways, need to be designed as wildlife-friendly structures. Minimum 6-m high elephant crossing underpasses should be planned at the identified sites, which would also serve the movement of other extant wildlife



# Mitigating the impacts of railway line doubling on biodiversity: A case study of Mollem National Park, Goa

-Niket Alashi

**Aim:** The study showcases the preliminary outcome of a cumulative environmental impact assessment of the proposed doubling of a railway track that passes through Mollem National Park, Goa. The biodiversity and habitat assessment are important to understand the feasibility of the project and suggest appropriate mitigation measures. This study highlights part of the ongoing assessment of mammals, avifauna, herpetofauna, vegetation and pollution (soil, water and plants) along the railway track.

**Location:** The study area encompasses Mollem National Park in Goa and part of Kali Tiger Reserve in Karnataka.

**Methods:** 128 camera traps were deployed along both sides of the track at 250m intervals for 30-60 days and the data was used to calculate species encounter rates and generate capture-intensity maps. A total of 75, 10-minute point-count observations were recorded to document the avifaunal diversity. Avifaunal abundance and richness were estimated using DISTANCE software and PAST respectively. For herpetofauna, Visual Encounter Survey and Belt Transects were carried out in dry and wet seasons respectively. Amphibians were tagged with Visible Implant Elastomer to detect movement. The Point Centred Quarter (PCQ) method was used for vegetation sampling and enumeration. 186 PCQs were sampled, and trees were enumerated at each 100m of the track. Topsoil (0-15cm), plants (4 spp.) and water samples (all water bodies) were collected up to 1km (inside) from the rail track (at every 5km) for assessment of contaminants using GC-MS and ICP-OES.

**Results:** Camera trapping yielded 5690 trap days. Gaur, sambar and wild pig were captured in 43, 39 and 38 locations. Tigers were captured in 5 locations. Leopards were captured in 21 locations. Wild dogs, golden jackals and sloth bears were also captured in multiple locations. Avian richness ranged from 1-12 species. 45 herp species were recorded. 218 plant species have been recorded. Significant heavy metal (Ca, Mg, Fe and Al) and polycyclic-aromatic hydrocarbon (Naphthalene, Phenanthrene, Pyrene and Chrysene) contamination was found.

**Conclusion:** The data is used to suggest the design and location of mitigation measures on the railway track.

## Project Title:

Cumulative Impact Assessment on wildlife habitat and ecological values due to proposed doubling of railway track from Tinaighat to Kulem in the Northern Western Ghats

## Principal Investigator(s):

Dr. Bilal Habib, Dr. Parag Nigam, Dr. Abhijit Das, Dr. Malvika Onial, Dr. Navendu Page

## Researcher(s):

Dr. Indranil Mondal (Project Scientist II), Dr. Jins VJ (Project Scientist II), Dr. Nikhil Modak (Project Scientist I), Dr. Sharfaa Hussain (Senior Project Associate), Dr. Sudip Banerjee (Principal Project Associate), Dr. Pooja Thathola (Senior Project Associate), Mr. Vijay Babu Nandwanshi (Project Associate II), Mr. Niket Nilesh Alashi (Project Associate I), Ms. Sonia, KB (Project Associate I)

## Funding Agency:

Rail Vikas Nigam Limited

## Project Duration:

One year

## Keywords:

Linear infrastructure, EIA, Western Ghat

## Twitter Handles:

@moefcc, @wii\_india, @moefcc, @wii\_india, @niket\_alashi, @IndranilMondal5, @sudipba1, @sharfaa\_hussain, @thathola\_pooja, @wildwithwolves

## Tweet:

Study highlights comprehensive steps towards assessing and mitigating the negative effects of railway doubling through a tropical forest. #railwayecology

**Project Title:**

Mitigation plan for up-gradation of Harrawala railway station, extension / additional loop line for handling 24 coaches at enroute stations and speed restriction between Dehradun-Haridwar railway station

**Principal Investigator(s):**

Dr. Bilal Habib, Dr. Parag Nigam, Dr SP Goyal

**Researcher(s):**

Aparna Suni(Project Associate)  
Rajat Singh Rana(Project Associate)  
Sonam Rajput(Project Associate)  
Upasana(Project Associate)  
Adil Khan(Project Associate)  
Amit Kumar(Project Scientist)

**Funding Agency:**

Divisional Railway Moradabad

**Project Duration:**

9 Months (Feb, 2023-Nov, 2023)

**Keywords:**

Crossing-hotspots, Railway ecology, Linear infrastructure, Camera trap.

**Twitter Handles:**

@moefcc, @wii\_india, @moefcc,  
@wii\_india, @wildwithwolves,  
@paragnigam09

**Tweet:**

Join us at Internal Annual Research Seminar @wii\_india for a presentation on assessing wildlife and habitat status to develop appropriate mitigation measures on the Harrawala-Haridwar railway line. @moefcc, @RajajinPark, @drm\_mb

# Assessment of wildlife status to develop the mitigation measures along the Harrawala-Haridwar Railway line

**-Aparna Sunil**

**Aim:** The expansion of railway network is critical for the country's development, yet it can have a significant impact on local ecosystems and species. This study was proposed to understand how wildlife utilizes space, locate crossing hotspots along the railway line, and propose measures that reduce disturbance to wildlife caused by the railway.

**Location:** The study was conducted along a 52km railway line between Harrawala and Haridwar, comprising a total of 27km forest patches of Dehradun Forest division and Rajaji Tiger Reserve.

**Methods:** Wildlife habitat utilization was assessed in an intensive study area (ISA) of 2km on both sides of the railway track. Vegetation survey was conducted using 10m circular plot at 200m intervals across the track. The existing structures i.e., culverts and bridges on track were assessed. The potential disturbance due to railway noise was recorded by HTC S-13A sound level meter. Sign survey for pellets was carried out within 10m circular plots at every 200m intervals. Trails crossing the track were also recorded. Wildlife presence was determined using camera trapping. ISA was partitioned into 165 grids ( $1 \times 1$  km<sup>2</sup>) and a single camera-trap was placed within each grid for a duration of 45 days (7365 trap nights).

**Results:** Among the different shrubs and trees species, *Murraya koenigii* ( $1293 \pm 6.44$  no/ha) and *Mallotus philipensis* ( $698 \pm 4.47$  no/ha) had higher density. The area was covered by 32% tree canopy followed by shrubs (27%) and grasses (21%). There are 72 existing culverts and bridges out of which 32 have the potential for animal crossing (culvert no. 122, 129 & 129 are hotspots). The noise disturbance was 64dB, up to a distance of 150m from the track, after which noise level became similar to ambient (55dB). We found 704 signs from 7 mammals. Chital had a higher abundance of pellet count compared to elephant, wildpig, and sambar. There were 74 animal trails crossing the track, of which 47 were utilised by elephants. A total of 26 wildlife species were recorded, with chital, sambar, and elephant being the most captured species.

**Conclusion:** Based on wildlife status and habitat characteristics mitigation strategies were proposed for Motichhur and Kansrao stations. These strategies include the construction of rubble wall and electrical fencing at Motichur station as well as the implementation of wildlife overpass at Kansrao station.

# Understanding the dance of Earth & Industry: A tale of mining and changing landscape in Chandrapur

-Neha Yadav

**Aim:** To evaluate the pattern in the land use and land cover change in and around mining areas of Western Coalfields Limited and Chandrapur Thermal Power Plant.

**Location:** Chandrapur district is located (19.25°N to 20.45°N and 78.50°E to 80.10°E) in the far east of Maharashtra state along the eastern part of the Vidarbha region of 11417 sq. km. Chandrapur city is a municipal corporation in Chandrapur district, located 19.57°N latitude and 79.18°E longitude positioned at an elevation of 189.90 meters above the mean sea level. The city is renowned for vast reserves of terrain rich in coal, large reservoirs of limestones and home to Western Coalfields Limited (WCL) & Chandrapur Super Thermal Power Station (CSTPS), 3340 MW capacity occupying 122.12 km<sup>2</sup>. It is also a natural bounty in the form of dense forest and wildlife encircling Tadoba Andhari Tiger Reserve (TATR), one of the vital reserves with largest numbers of tigers in central India.

**Methods:** Sentinel-2 and Landsat series imagery data for 29 active mines (underground mines (UG) and open-cast (OC) mines) was used to evaluate land use and land cover changes. The analysis has been done in Google Earth Engine (GEE) and ArcGIS Pro with 11 distinct land cover classes over the period spanning from 1999 to 2021. Ground verification was conducted in order to identify the correct location of each mine and their extent. The analysis was conducted at multiple levels, i.e. the Chandrapur district scale, mine cluster/zone scale (5 zones), the CSTPP and individual mine level. By scrutinizing the alterations in these specific land cover categories, we aimed to gain insights into the changing landscape to mining and power plant activities.

**Results:** Our analysis revealed dynamic shifts in mining activity over the study period. The landscape displays noticeable fluctuations in forest cover and varying vegetation land over time. Notably, there was a substantial surge in mining operations in 2011 and 2018, with increases of 89.96% and 42.43%, respectively. Conversely, a decline of 26.24% was observed in 2014, followed by a further reduction of 44.60% in 2019. Areas with a higher prevalence of OC mines indicated more profound alterations in Land use. We also found overburden dumps, reaching heights of up to 90 meters, can impede animal movement due to their undulating topography and substantial elevation, at some mines.

**Conclusion:** Mining, changes in land use, and the environment interact intricately. Such changes carry the potential to significantly impact the existing ecological framework and overall landscape. Remote sensing data proves valuable in monitoring mining activities and guiding land use planning, and ecological recovery efforts.

## Project Title:

Understanding the impact of mining area of Western coalfield limited & Chandrapur super thermal power station in Chandrapur district Maharashtra

## Principal Investigator(s):

Dr. Bilal Habib

## Researcher(s):

Akanksha Saxena (Senior Project Associate),  
Ankita Sharma (Project Associate-I),  
Neha Yadav (Project Associate-I),  
Nidhi Goyal (Project Associate-I),  
Saumyata Srivastava (Project Associate-I),  
Sougata Sadhukhan (Project Associate-II)

## Funding Agency:

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

## Project Duration:

March 2021 - December 2023

## Keywords:

Land use & land cover, remote sensing,  
Google Earth Engine and ArcGIS Pro

## Twitter Handles:

@moefcc, @wii\_india, @moefcc, @  
wii\_india, @wildwithwolves, @bhlab\_india,  
@N\_e\_h\_a\_yadav, @agarwalnidhi782, @  
AnkitaS32425539

## Tweet:

Exploring the Dance of Earth & Industry:  
Chandrapur's Changing Landscape Discover  
how mining shapes Chandrapur's terrain.  
Balancing industry and nature is crucial!  
#MiningImpact #ChandrapurEnvironment  
#iars2023 #wii

**Project Title:**

Conservation Ecology of endangered Reticulated Python *Malayopython reticulatus* (Schneider 1801) in the Nicobar Archipelago, India

**Principal Investigator(s):**

PI: Dr. Ramesh Chinnasamy,  
Dr. Nehru Prabhakaran,  
Dr. S.K. Gupta

**Researcher(s):**

Jyoti Nagarkoti & Dhanesh P  
(Junior Research Fellow)

**Funding Agency:**

Science and Engineering Research Board  
(F.No: CRG/2021/005095), Department of  
Science and Technology, Govt. of India

**Project Duration:**

25 January 2022 to 24 January 2025  
(3 Years)

**Keywords:**

NA

**Twitter Handles:**

@moefcc, @wii\_india, @Jyoti\_ii, @  
dhanesh\_ponnu, @Ramesh14170479,  
@nehtrup, @SKGupta72595166

**Tweet:**

Exploring enigmatic Nicobar Islands; unveiling serpentine wisdom, practices, and knowledge within local communities through our work getting presented on the occasion of IARS 2023 to be held at WII on Sep 12-14, 2023.

# Fear and Fascination: Exploring Communities Perceptions, Attitudes, knowledge and Practices surrounding snakes in the Nicobar Archipelago

**-Jyoti Nagarkoti**

**Aim:** Snakes are typically linked to fear and aversion within human communities. The study aims to know the perception, attitude, knowledge and practices concerning snakes among the communities of Nicobar.

**Location:** The Nicobar Archipelago consists of 22 islands among them the study was conducted in six islands viz., Nancowry, Trinket (17.78 km<sup>2</sup>), Katchal (161 km<sup>2</sup>), Tarassa (91 km<sup>2</sup>), Chowra (8 km<sup>2</sup>) and Car Nicobar (127.56 km<sup>2</sup>).

**Method:** The interviews were carried out through a questionnaire with quantitative and qualitative questions. The study was conducted between February 2023 and July 2023, involving 347 interviews across the Nicobar Archipelago.

**Result:** Results indicated that most participants could distinguish only a limited number of snakes. Negative attitudes towards the snakes were predominantly linked to prior encounters with snake bites and awareness of the potential snake bites and their associated impairments. Notably, the participants did not express any thoughts regarding snake conservation and coexistence. Analysis of snake bite incidents revealed that 46% of the reported bites predominantly targeted lower limbs (84%). Pit vipers, notably the Nicobar pit viper (*Trimeresurus labialis*) were primarily responsible for the snake bites. The traditional methods retained popularity despite the availability of healthcare facilities. The reticulated python is the most frequently consumed species while its gallbladder and fat are extensively used for medicinal purposes.

**Conclusion:** Negative sentiments towards snake conservation, accompanied by fear due to personal snake bite encounters drove the inclination towards retaliatory killings of snakes. The impairments and deaths resulting from the snake bites have yet to receive sufficient attention. If the ongoing conflict between the local population and snakes persists, the snake population could experience a sharp decline, potentially leading to the extinction of several endemic and rare species. Hence, there is an urgent requirement for awareness campaigns on snakes and their ecology, and the intervention of forest authorities becomes imperative to foster harmonious human-snake coexistence

# Jalaj: Synergistic Approach to Livelihood Generation and Biodiversity Conservation along the Ganga River

-Ms. Sneha

**Jalaj:** Synergistic Approach to Livelihood Generation and Biodiversity Conservation along the Ganga River

**Introduction:** The Ganga River, revered as the lifeline of India, is not only a source of spiritual significance but also a crucial ecosystem supporting diverse flora and fauna. The degradation of the river's water quality and the decline of its biodiversity have raised concerns regarding sustainable development and livelihood opportunities for the communities residing along its banks.

**Aim:** The study aims to investigate and implement the potential of an integrated approach that combines livelihood generation strategies with the conservation of Ganga River and its biodiversity.

**Location:** The five states including Uttarakhand, Uttar Pradesh, Bihar, Jharkhand and West Bengal that are enriched by the waters of the Ganges River and its tributaries.

**Methods:** The research adopts a mixed-methods approach, incorporating field surveys, and stakeholder consultations. Through participatory rural appraisals, local communities' perceptions and traditional ecological knowledge are integrated, providing valuable insights into sustainable livelihood practices using local resources. Additionally, study of the ecological surveys, assess the current state of Ganga biodiversity and its water quality, enabling the identification of key conservation areas under the five major cities along the Ganga River.

**Results and Discussion:** The results indicate a positive correlation between livelihood generation and biodiversity conservation. Improved livelihoods can reduce pressure on natural resources, subsequently alleviating stress on the Ganga's ecosystems. Livelihood diversification emerges as a promising strategy, reducing dependence on the rivers resources while simultaneously fostering economic growth. With this vision 26 Jalaj centers has been established in different states along the Ganga and 49 more are proposed. The healthier ecosystems foster increased biodiversity, which in turn supports sustainable livelihoods through ecotourism and other income-generating activities. The creation of community-based resource management institutions empowers locals to actively engage in decision-making, ensuring the long-term success of conservation efforts and livelihood initiatives. The study highlights the significance of adopting a holistic approach to address the intertwined challenges of livelihood generation and biodiversity conservation along the Ganga River. It reveals the challenges and opportunities associated with implementing the proposed approach.

## Project Title:

JALAJ "Connecting River and People to Realize Arth Ganga"

## Principal Investigator(s):

Dr. Ruchi Badola, Mr. Syed Ainul Hussain

## Researcher(s):

Ms. Sneha Sharma (Project Associate II), Ms. Anjana Sharma (Project Associate II), Ms. Richa Dubey (Database), Mr. Prashant, Mr. Aman, Ms. Twinkle, Ms. Shivangi, Ms. Deepika, Ms. Shalini, Ms. Payal, Mr. Saurav Gawan (Project Scientist)

## Funding Agency:

NMCG

## Project Duration:

2 years

## Keywords:

Ganga, livelihood, Community based conservation

## Twitter Handles:

@moefcc, @wii\_india, @snehasharma3990, @Jalaj\_wii, @RuchiBadola2, @SyedAinul-Hussa2, @sauravgawan, @Prashant\_Harit\_

## Tweet:

Jalaj: A Synergistic Approach to Conservation of Freshwater Biodiversity with Sustainable Livelihood Generation realising the goals of Arth Ganga in Ganga River Basin.

**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, Capt. Dr Parag Nigam, Dipesh Malhotra (DCF)

**Researcher(s):**

Sajid Reza (Project Associate I), Kanishka (Project Associate I), A. Krishnan (JRF), Suman Koley (JRF), Jaydeep Patil (JRF) Advaita Ravindran (JRF), Anubhuti Krishna (Project Associate-I), Anjali Thapliyal (Project Associate), Khadija Sultana (Project Associate-I), Akshayi AS (Senior Project Associate – RS & GIS), Shaheer Khan (Senior Project Associate)

**Funding Agency:**

Maharashtra Forest Department

**Project Duration:**

2019 – 2029

**Keywords:**

Carnivore interaction, Forest fragmentation, Camera trap, Activity pattern.

**Twitter Handles:**

@moefcc, @wii\_india, @moefcc, @wii\_india, @bhlab\_india, @wildwithwolves, @paragnigam09 @reza\_lone\_wolf, @MahaForest

**Tweet:**

Thriving on the Fringe: Discover how carnivores are making their mark in our human-dominated world. #Carnivore #humandominatedlandscape #IARS #Coexistence

# Living at the edge: Carnivores in human dominated landscape

-Sajid Reza

**Aim:** To investigate the co-occurrence of two large carnivore species, tigers (*Panthera tigris*) and common leopards (*Panthera pardus*), within a human dominated landscape.

**Location:** Bramhapuri Forest Division (1033.87 km<sup>2</sup>) and Ghodazari Wildlife Sanctuary (159 km<sup>2</sup>) in the Vidarbha region of Maharashtra.

**Methodology:** Camera trapping was conducted for 30 days (May-June 2022) in a single block (8670 trap-nights) with a total of 289 camera traps (pair). LULC data were acquired from Sentinel 2 MSI of ESA. Further, patch level and class level metrics were derived from classified satellite images in FRAGSTATS. A GLM incorporating environmental, habitat and anthropogenic factors was used to identify key variables that influence the occurrence of large carnivores.

**Results:** The study area has a patch density of 3.33 patch/km<sup>2</sup>. Amongst all land cover classes, Cropland occupied maximum area (55%) followed by forest cover (40.45%). and others (15%)

Female tigers use forest-cover (91.1%) followed by Cropland (7.9%). Whereas males use forest-cover (78.1%), followed by Cropland (19.7%). While female leopard use forest-cover (96%), followed by crop land (3%). Whereas males use forest-cover (83.8%) followed by cropland (14.2%).

Both tigers and leopards showed crepuscular activity patterns with a high overlap (Dhat I = 0.87), but tigers were less active during the day compared to leopards. Drainage density, shrubland, tree-cover, cattle RAI, distance from settlements, and roads, were positively associated with tiger capture, while distance from highways was negatively associated (P > 0.05). In case of leopard, tiger capture, cattle RAI and drainage density were positively associated, while population density was negatively associated (P < 0.05).

**Conclusions:** The study provides insights into the factors driving carnivore presence in human-dominated environment, shedding light on the interactions between apex predator and human-altered landscape. Males of both the species uses more cropland and less forest cover when compared to their females. It demonstrates that sympatric large carnivores can coexist in high densities in areas that contain mosaic of habitat



# Effective mapping of seagrass distribution using remote sensing and GIS in Critical Dugong Habitats (CDHs) in India.

-Sohom Seal

**Aim:** Recent studies have shown a decline in dugong (*Dugong dugon*) populations or even their functional extinction due to the loss of seagrass habitats. India has an estimated seagrass cover of 95.19 km<sup>2</sup> and is estimated to host a dugong population of 200-250 individuals, alongside other associated fauna. With the increasing environmental impacts of anthropogenic activities on individual species, understanding the relationship between habitat factors is an essential step towards predicting the distribution of such elusive and endangered species. Therefore, to identify potential dugong habitats, we tried to map seagrasses using remote sensing and GIS technologies.

**Location:** We conducted this study in selected CDHs, namely, South Andaman (SA), Andaman & Nicobar Island, north Palk Bay (PB) and Gulf of Mannar Marine National Park (GoM), Tamil Nadu.

**Methods:** We conducted intertidal and subtidal surveys to record in situ seagrass presence locations. We used the Google Earth Engine platform to map the seagrass distribution of these regions with Sentinel-2 imageries. We tested the following classifiers at every water condition for the best fit in terms of overall accuracy and Kappa value: Unsupervised: K-means, Supervised: Maximum Distance (MD), Support Vector Machine (SVM), Correlation and Regression Tree (CART), Naïve Bayes and Random Forest.

**Results:** With comparatively clearer waters in SA and GoM, the highest accuracy of 96% and 79%, respectively, was obtained by using CART, whereas, in turbid waters of PB, the random forest was proved to be the best algorithm with 70% accuracy. Random forest also gave decent accuracy in clearer waters of SA and GoM, making it the most general algorithm to be used in any level of turbid waters.

**Conclusion:** We infer that turbidity negatively affects the classification accuracy to a major extent. The limitations in accuracy can be addressed by testing various classification algorithms with respect to the site parameters specific to the study area. The output maps of seagrass distribution show that South Andaman and Gulf of Mannar Marine National Park have lesser seagrass cover than Palk Bay

## Project Title:

CAMPA-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,  
Dr. Mini Raman

## Researcher(s):

Sohom Seal (PhD Scholar & UGC Senior Research Fellow)

## Funding Agency:

CAMPA

## Project Duration:

2016-25

## Keywords:

seagrass mapping, Google Earth Engine, dugongs, random forest, CART

## Twitter Handles:

@moefcc, @wii\_india, @moefcc, @wii\_india, @the\_sohom, @ksivakumarwii, @jajohny2013, @nehtrup, @CAMPA\_dugong\_wii

## Tweet:

Effective mapping of #seagrasses using #remotesensing and #GIS in critical dugong habitats #CDH in #India

**Project Title:**

Pan India assessment and monitoring of endangered species covered under the Integrated Development of Wildlife Habitats (IDWH)

**Principal Investigator(s):**

Dr. Gautam Talukdar, Dr. Nehru Prabakaran, Dr. Amit Kumar, Dr. Navendu Page

**Researcher(s):**

Sneha Pandey (Project Associate- II)  
Himani Khati (Project Associate- II)  
Debanjan Sarkar (Senior Project Associate)

**Funding Agency:**

MoEFCC

**Project Duration:**

December 2022 - December 2024

**Keywords:**

SDM, Habitat Mapping, Endangered species, PAN India

**Twitter Handles:**

@moefcc, @wii\_india, @SnehaPandeyy, @himani\_khati, @imDebanjan, @amitwii

**Tweet:**

Under the IDWH project, the Habitat Mapping component will study the habitats of selected endangered species reported from India. Species distribution models for 12 species have been presented at the IARS #idwh #habitat\_mapping #endangered\_species

# From Data to Conservation: Mapping distribution of selected Endangered Mammal and Bird species in India

**-Sneha Pandey and Himani Singh Khati**

**Aim:** The IDWH-Habitat Mapping component aims to assess and monitor certain selected habitats of endangered species covered under IDWH. To assess various environmental variables that are relevant to species habitat and fine scale information about the landscape we have used species distribution modelling (SDM) approach. We have modelled the distribution of 9 endangered mammal species (Red panda, Great one horned rhino, Swamp deer, Wild water buffalo, Nilgiri tahr, Asiatic lion, Caracal, clouded leopard and Snow leopard) and 3 endangered bird species (Nicobar megapode, Edible Nest swiftlet and Jerdon's courser). The results will be subsequently used for their long term habitat monitoring.

**Location:** The study is being carried out at PAN India scale covering the distribution range of the selected mammal and bird species.

**Methodology:** We obtained occurrence data from various sources- literature review (Publications, scientific reports and academic dissertation thesis), Global Biodiversity Information Facility (GBIF) and individual researchers. The presence points were filtered and rarefied to avoid duplicates, localities with missing coordinates and other errors. In addition to this, based on the number of presence points and environmental heterogeneity spatial autocorrelation was performed for the environmental covariates. Different sets of suitable environmental covariates were used for each species, based on their ecology, habitat requirements and other parameters. Species Distribution Modelling was performed using the presence-only Maxent (maximum entropy) model.

**Results and discussion:** The output models were robust for both endangered mammal and bird species based on selected variables with high AUC values (0.7-0.95). The environmental variables contribution varied model wise for each species. Environmental variables – Forest density, Forest class, LULC, Elevation, temperature and precipitation exhibited highest contribution for endangered mammals. In case of endangered birds, environmental variable- LULC, Forest class, Forest density, Elevation and NDVI contributed the most. Based on the SDM output the habitat suitability maps will be prepared. Outputs will be distributed to each component under the IDWH Project for their comments and ground truthing. Further we will be monitoring the habitat patterns and suitability using recent LULC data and seasonally modeled outputs for selected species.



# Harmony in Habitats: Mapping the vital elephant corridors of India

-Udhayaraj AD

**Aim and Introduction:** Wildlife corridors facilitate animal movement between habitat patches which play a crucial role in biodiversity conservation by promoting genetic diversity, migration, and reducing the risk of inbreeding among populations. Most corridors that exist today are either fragmented or surrounded by human-dominated land, and thus elephants come directly into conflict with humans. Thus, securing elephant corridors has long been considered an important strategy to conserve elephants and minimize human-elephant conflict. Therefore, we attempted to evaluate the current status of the elephant corridors in the country and assess the extent of decadal land-use and land-cover changes (LULC).

**Study Area:** The study was undertaken on the Pan India scale, covering 15 elephant range states across the four elephant-bearing regions.

**Approach and Method:** Mapping elephant corridors entailed indicating the location of the corridor which was received as duly filled-in data forms elucidating the attributes of elephant corridors from the respective forest departments. Additionally, the current status of the corridor is evaluated. Further, using geospatial layers for the years 1985, 1995, 2005, and 2018 broad comparisons between the years were made on the LULC of the elephant corridors to assess any major potential disparity between the years.

**Results and Discussion:** A total of 150 elephant corridors were reported from 15 elephant range states across the four elephant-bearing regions of India. It is found that in 40% of elephant corridors, the intensity of use by elephants has increased and 15 have been reported as impaired. Decadal LULC change has been analyzed for 101 corridors. The results show that among four elephant bearing regions, the forest cover of elephant corridors in the North Eastern region has decreased by 10% followed by 7% in the Southern and East Central regions and 4 % in the Northern region. Our study has created a baseline for the identification and mapping of elephant corridors in the country. Further, it would be important to delineate the boundaries both in the map as well as in the ground, and assess the long-term land-use change within the corridors.

**Project Title:**  
Elephant Cell

**Principal Investigator(s):**  
Shri. Ramesh Kumar Pandey,  
Dr. Parag Nigam, Dr. Bilal Habib,  
Dr. Muthamizh Selvan

**Researcher(s):**  
Udhayaraj AD - GIS Specialist.

**Funding Agency:**  
Project Elephant, MoEF&CC

**Project Duration:**  
Till March 2024

**Keywords:**  
Elephant corridor, movement, distribution,  
ground validation, land-use

**Twitter Handles:**  
@moefcc, @wii\_india, @udhayar230,  
@paragnigam09, @wildwithwolves, @  
rameshpandeyifs

**Tweet:**  
Harmony in Habitats! With the collective efforts of PE, @moefcc and State Forest Departments with technical support from @wii\_india, 150 elephant corridors across the country has been mapped and current status has been evaluated.

**Project Title:**

Long Term Monitoring of Tigers, co-predators and prey in tiger bearing areas of Vidarbha, Maharashtra

**Principal Investigator(s):**

Dr. Bilal Habib, Capt Dr. Parag Nigam, Dr. Jitendra Ramgaonkar, Mr. N.V. Kale, Mr. Kushagra Pathak

**Researcher(s):**

Anjali Thapliyal (Project Associate), Mr. Zehidul Hussain (Principal Project Associate)

**Funding Agency:**

Maharashtra Forest Department, Govt of Maharashtra

**Project Duration:**

2019-2029

**Keywords:**

Activity, Energy expenditure, Human-dominated, Large carnivore, Time-budget

**Twitter Handles:**

@moefcc, @wii\_india, @wildwithwolves, @bhlab\_india, @paragnigam09, @MahaForest

**Tweet:**

Identification of Behavioral States of Tiger using Tri-axial Acceleration Sensor data in Eastern Vidarbha Landscape of Maharashtra #iars2023 #wii #accelerometer #tigerbehaviour #energyexpenditure #activitydata

# Identification of behavioral states of tiger using tri-axial accelerometer data in Vidarbha Landscape, Maharashtra

**-Anjali Thapliyal**

**Aim:** Tigers in human-dominated landscapes face significant risk due to increased anthropogenic pressure and habitat degradation. However, tigers' behavioral plasticity may be a primary factor facilitating coexistence with humans, allowing the species to adjust their activity to minimize human risk. To better understand the energy expenditure in tigers associated with their behavioral switch, we fitted a female tiger a high-resolution GPS radio collar with a tri-axial acceleration sensor.

**Location:** The study was conducted in the Eastern Vidarbha Landscape of Maharashtra.

**Method:** We quantified the Vectorial Dynamic Body Acceleration (VeDBA) as a measure of energy expenditure using a custom software "Daily Diary Multi-Trace" (DDMT). The frequency of the accelerometer was 8 Hz. Data was analyzed in DDMT to classify behavioral states using the Boolean time-based decision tree. We synchronized camera traps data and field site videos with acceleration data to validate our findings. We used hourly mean VeDBA to understand the relationship between behavior state and seasonal activity.

**Results:** We identified behavior as resting, low-speed non-purpose walking, high-speed directional walking, and hunting. Observing the tri-axial acceleration and VeDBA measurements, we were able to determine that  $X > 0.67$ ,  $Y < -0.88$  and  $VeDBA < 0.001$  signifies 'resting' whereas  $X < -0.4$  and  $0.03 < VeDBA < 0.06$  indicated 'low-speed non-purpose walking'. 'High-speed directional walking' was associated with higher values of VeDBA lying between 0.1 and 1.2 and the values above 1.2 was categorized as 'hunting'. Seasonal fluctuations in VeDBA demonstrate that energy expenditure was the highest during winter and minimum in summer. GAM result shows that the tiger was more active in winter ( $p < 0.05$ ).

**Conclusion:** Higher energy expenditure in winter subsequently amounts to increased energy requirements for survival. Identifying tiger behavior in landscapes dominated by humans provides insights into their activity and responses to human disturbances. Moreover, understanding their energy requirements contributes to effective conservation and management.

# Modelling Habitat Suitability and Movement Corridors for Tigers and Rhinoceros in Transboundary Terai-Arc Landscape

**-Manisha Bishnoi**

The transboundary Terai Arc Landscape (TAL), spread across the terai regions of India and Nepal, is a 'global priority' tiger conservation landscape, comprising protected areas (PAs) connected by intervening forest patches. TAL is also a highly productive landscape that has witnessed rapid anthropogenic development in the past decades, affecting wildlife connectivity within the landscape. With this background, we aimed to identify suitable habitat and connectivity corridors for tiger and rhinoceros, two iconic species of the landscape.

The transboundary TAL spread across 49,500 km<sup>2</sup>, lies between the rivers Yamuna and Bhagmati, and consists of several PAs interspersed within forest and non-forest areas. The landscape consists of low-lying hills, lower Himalayas and Terai plains.

We collated rhinoceros and tiger occurrence data from different sources (scientific and grey literature, citizen science, camera trap data). We predicted suitable habitat for the study species using different environment predictors potentially influencing species occurrence using presence-only modelling. We then used the habitat suitability map as a conductance layer and PAs to model connectivity for the species using Circuitscape. We further identified pinch points for species movement using Linkage Mapper.

We collated 716 tiger and 632 rhinoceros occurrence points. Our findings indicate that a significant portion of TAL habitat exhibited low suitability for tigers (78.46%) and rhinoceros (93.9%). The majority of areas rated as moderately to highly suitable for these species were predominantly situated within PAs, accounting for 21% of the suitable habitat for tigers and 6% for rhinoceros. Within TAL, we found high connectivity between the Kalesar-Simbalbara complex, with Rajaji West, Rajaji and Corbett, Corbett and Nandhaur, and Bardia and Banke showing high connectivity for tigers. The transboundary connections between Sohelwa and Chitwan, Sohelwa and Banke, Katarniaghat and Bardia, and Nandhaur and Shuklaphanta were also found to be highly suitable, and to be prioritised. We found high connectivity for rhinoceros between Banke and Bardia, and between Dudhwa and Bardia. The distant connectivity between Sohelwa and Chitwan was through the Dovan corridor, which could be prioritised for long-term rhinoceros conservation.

## **Project Title:**

Conserving Vital Connections Across Expanding Linear Infrastructure in a Transboundary Terai Arc Landscape (TAL)

## **Principal Investigator(s):**

Dr Bilal Habib, Dr Naresh Subedi, Dr Babu Ram Lamichhane, Dr Anthony P Clevenger, Dr Clara Grilo

## **Researcher(s):**

Manisha Bishnoi (Project Associate), Akanksha Saxena (Project Scientist)

## **Funding Agency:**

USFWS (US Fish and Wildlife Services)

## **Project Duration:**

4 years

## **Keywords:**

NA

## **Twitter Handles:**

@moefcc, @wii\_india, @moefcc, @wii\_india, @wildwithwolves, @bhlab\_india, @ManishaBishnoi14, @akadarj, @l baburam, @USFWS

## **Tweet:**

The status of transboundary connectivity in TAL for tigers and rhinoceros was presented. This study would further be used to identify and study critical connectivity areas affected by linear infrastructure in both nations India and Nepal. #IARS2023

**Project Title:**

Evaluation of efficacy of various population estimation methods for elephants, to develop population monitoring protocol.

**Principal Investigator(s):**

Dr Bilal Habib, Dr. (Capt). Parag Nigam,  
Dr. Muthamiz Selvan

**Researcher(s):**

Ms Charanjot Kaur (Project Associate – I)  
Ms Mansi Arora (Project assistant)  
Ms Rima Sadhukhan (Project Intern)  
Mr Shiv Kumar Chaudhary (Project Intern)  
Ms Simran Sawan (Project Intern)  
Mr MP Abu Ashique

**Funding Agency:**

Ministry of Environment, Forest and  
Climate Change (MoEFCC)

**Project Duration:**

1 year

**Keywords:**

NA

**Twitter Handles:**

@moefcc, @wii\_india, -@moefcc,  
@wii\_india, @wildwithwolves,  
@bhlab\_india

**Tweet:**

Elephant Enthusiasts, This One's for You!  
Dive into our in-depth analysis of Asian  
elephant populations in Rajaji Tiger  
Reserve, Uttarakhand. #Elephant  
Conservation #WildlifeStudy  
#iars2023 #bhlab

# An approach for developing a unified protocol for monitoring elephant populations

**-Charanjot Kaur**

**Aim:** Estimating population size is essential for wildlife management. Different methods were followed in estimating the population size estimation of Asian elephants, however, lacks the comparative analysis to determine which one is efficient and cost-effective.

**Location:** Seven ranges of the western part of the Rajaji Tiger Reserve, Uttarakhand.

**Methods:** We collected information on (i) tagged dung for decay estimation (ii) unique photo identity, fecal DNA and segment analysis in capture-recapture (CR) and spatially explicit capture-recapture framework (SECR) (iii) line transects. We gathered photographic data from direct elephant sightings along the 363 km vehicle-accessible roads. Using morphological traits, we identified individual elephants (excluding juveniles and calves) and assigned a unique ID. Additionally, we walked 31 line transects (1 to 2 km) to estimate population density under a distance sampling framework. We estimated the population based on 1084 and 147 fecal samples collected across the study area and transects respectively. We optimized published sex markers and multiocus microsatellites.

**Results:** We recorded 556 elephant individuals of different age groups during 90 sightings across the study area and identified 103 unique individuals based on 22 morphological traits. The estimated overall abundance based on the capture history of identified individuals in CR was 411.3 ( $\pm 127.4$  SE) individuals. The estimated male abundance was 131.3 ( $\pm 51.3$  SE). To estimate the dung decay rate, we tagged 87 dung piles and monitored them once a week. The dung decay rate estimate for the Shivalik forest during summer was 0.0038 dung piles/day. We also did SECR analysis of the identified individuals and animals recorded in segments to estimate population size; the estimated density is 1.2/km<sup>2</sup>. For fecal DNA-based population estimation in CR and SECR, we optimized 5 sex markers and 10 multilocus microsatellite markers for sex-based individual identification.

**Conclusion:** After an overall analysis of different methods, we will provide a precise and cost-effective method for elephant population estimation.

# Effects of socio-ecological forces shaping striped hyaena population in the Western Ghats

-Ashish Kumar

**Aim:** Interspecific competition plays a key role in shaping the structure of carnivore communities. Top-down effects can impact the coexistence of superordinate and subordinate competitors and prey across a shared landscape. Limited resources, their abundance and diminishing declining and deteriorating habitats, can all exacerbate interspecific competition among sympatric carnivores.

Coping behavioural mechanisms or adaptations are critical for smaller or subordinate carnivores to coexist with larger species. Striped hyaena (*Hyaena hyaena*) and golden jackals (*Canis aureus*) are the important species that co-occur with large predators. Hyaenas and jackals are meso-carnivores that are predominantly scavengers and species of secondary forest habitat. In face of increasing climate change, invasion of non-native plant species, deterioration secondary habitat and large predator centric habitat management, we propose to study their distribution and top-down effect on hyaena.

**Location:** India and Europe

**Methods:** To map their distributions, several literature sources including published-unpublished reports, district gazetteers, scientific reports, newspaper reporting will be surveyed. Furthermore, carnivore researchers, protected area managers, foresters, hunters, and farmers will be contacted. All relevant data will be gathered to collate fine-scale information on detections and non-detections along with any population indices of both focal species as well as large predators. Top-down effect on the species will be studied using non-parametric method like random forest by calibrating occurrence of meso-carnivores as a function of corresponding large predators and bio-geoclimatic variables like temperature, vegetation parameters, anthropogenic measures and topography.

**Results:** NA

**Conclusion:** The study will be instrumental to provide country level fine scale distribution map of hyaena as well as distribution map of jackal for India and Europe with the effect of large predators.

**Project Title:**

Modeling the effect of top predators and habitat on the distribution of mesocarnivores in large-carnivore landscapes of India and central Europe

**Principal Investigator(s):**

Dr. T. Ramesh

**Researcher(s):**

Mr. Ashish Kumar (PhD Scholar)

**Funding Agency:**

Science & Engineering Research Board, Department of Science & Technology, Government of India

**Project Duration:**

2 years

**Keywords:**

Striped Hyaenas; Golden Jackals; Top-down effect; meso-carnivore; random forest

**Twitter Handles:**

@ashishtf

**Tweet:**

Modeling the effect of top predators and habitat on the distribution of mesocarnivores

**Project Title:**

Assessing human-peafowl conflict and developing an action plan to reduce the conflicts in select zones of Tamil Nadu

**Principal Investigator(s):**

Dr. H.N. Kumara, Dr. S. Babu,  
Dr. S. Muralidharan

**Researcher(s):**

R. Kishore and B.K. Aravindan,  
(Field Biologists)

**Funding Agency:**

Forest Department, Tamil Nadu

**Project Duration:**

1 year

**Keywords:**

population status, human-peafowl conflict,  
Tamil Nadu

**Twitter Handles:**

NA

**Tweet:**

NA

# Population Status and Perception of People on Human-Peafowl Conflict in Tamil Nadu

-R. Kishore

The Indian peafowl *Pavo cristatus* being the National Bird of India is protected under Schedule I of the Indian Wildlife Protection Act 1972. Though the peafowl is revered as a cultural icon, it has been threatened by poaching and poisoned by farmers as they are considered a main agricultural pest. They are widely distributed due to their omnivorous habit and high adaptability. Agriculture is one of the main occupations in the rural areas of India including Tamil Nadu, where often crop raiding by peafowl is reported thus increasing peafowl conflict.

We aimed to assess the peafowl population, human-peafowl conflict in Tamil Nadu, and list the mitigative measures used by people. The population was assessed through random grid sampling using vehicular road transects. For every 500 m, land use, vegetation, and crops were recorded. On sighting of a bird, distance from the road/observer, group size, age, and sex of the individuals were recorded. In each grid cell, a minimum of two people were interviewed using a structured questionnaire comprising details of the peafowl sighting frequency, population trend, crop raiding intensity, mortality, and scaring devices used by them. Information from newspapers, and published and unpublished reports on conflict were obtained to identify the human-peafowl conflict.

We ~1397 km of survey effort was made in 214 grid cells. The high peafowl populations were recorded in Krishnagiri, Thiruvannamalai, Tenkasi, Thoothukudi, Tirunelveli, and Tiruppur. The paddy, maize, cereals, and vegetables are the most damaged crops while sugarcane, plantain, cotton, tubers, and flowers are the least damaged. 269 of the 1136 people interviewed revealed using various methods to keep away the peafowls includes manual chasing, chasing away by dogs, scarecrows, reflective ribbons and threads, audio playback, crackers, beating tin or plate with sticks, and change of crops.

The effective methods used by farmers are chasing by dogs (37.53%), manual chasing (31.93%), and change of crops (16.24%). Some farmers in the foothill regions are especially using a device made up of oil tins to produce huge sound as it repels both peafowl and wild boar.

# The impact of invasion of invasive species on habitat use of gaur in Bandipur Tiger Reserve, Karnataka

**-Ms. Subhadra Barik**

**Aim:** One of the major biodiversity crises, the invasive species, has the ability to alter any ecosystem processes such as decomposition, hydrology and nutrient cycle and has radical effects in altering fire regimes in several Protected areas (PAs). Furthermore, it has also been seen that they compete with the native plants for critical and often limited natural resources impacting the growth of the native plants. They have detrimental effects on herbivore species as it changes the structure of the invaded area and alter the vegetation type. Henceforth, this study was proposed to explicitly explain the responses on the habitat use of Indian gaur to the biological invasion of three major floral invasive species in Bandipur Tiger Reserve.

**Location:** Bandipur Tiger Reserve, Karnataka

**Methods:** The study is conducted by a combined multi-frame approach. A total of 1456.309 Km<sup>2</sup> area was surveyed through a systematic grid-based sampling method. The survey included field visits for vegetation surveys and the help of remote sensing and GIS are taken for mapping purposes. Along with vegetation surveys, the proliferation of the invasive species has been documented across 51 grids enlisting 21 different co-variables on habitat, anthropogenic and climate features to assess the impact of invasion of these invasive species on the habitat selection of gaur.

**Results:** The result showed a combined relationship between invasive species and gaur habitat use. It showed minimum occurrence of gaur in the areas which are highly invaded by invasive species.

**Conclusion:** The study will provide data for management of invasive species and will help in grassland management. This will also facilitate tiger-centric conservation programs.

**Project Title:**

Evaluation of suitable habitat of Indian Gaur population with special emphasis on invasive species and wildfire in Bandipur Tiger Reserve, Karnataka

**Principal Investigator(s):**

Dr. T. Ramesh

**Researcher(s):**

Ms. Subhadra Barik (INSPIRE Fellow)

**Funding Agency:**

Department of Science & Technology (DST), Government of India

**Project Duration:**

5 years

**Keywords:**

Invasive species; plant-animal interaction; megaherbivores; ecological modelling

**Twitter Handles:**

@wildhours\_99

**Tweet:**

Impact of invasion of invasive species on habitat use of gaur

**Project Title:**

Assessing anthropogenic threats to large carnivore population in the Western Ghats part of Tamil Nadu, southern India

**Principal Investigator(s):**

Dr. T. Ramesh

**Researcher(s):**

Ms. Milda David (Research Scholar)

**Funding Agency:**

Science & Engineering Research Board,  
Department of Science & Technology,  
Government of India

**Project Duration:**

5 years

**Keywords:**

Dhole; Human-carnivore conflict; Leopard;  
Livestock depredation; Tiger

**Twitter Handles:**

NA

**Tweet:**

Threats to large carnivore population in  
Tamil Nadu

# Assessing anthropogenic threats to large carnivore population in the Western Ghats part of Tamil Nadu, southern India

**-Ms. Milda David**

**Aim:** The burgeoning resource-use overlap from human dependence on natural resources and forest degradation inflicts large carnivores to move into the fragmented landscapes owing to their wide home range, leading to conflict with humans. The objectives of our study were to identify the spatial and temporal characteristics of livestock depredations by large carnivores tiger (*Panthera tigris*), leopard (*Panthera pardus*) and dhole (*Cuon alpinus*), to quantify the effect of ecological anthropogenic pressure and habitat loss on the spatial distribution of large carnivores and to assess the effectiveness of Protected Area (PA) management in minimizing human-large carnivore conflicts (HCC).

**Location:** 16 Forest Divisions across Eastern and Western Ghats part of Tamil Nadu. **Methods:** We collected information on HCC and effectiveness of Protected Area management using semi-structured questionnaire surveys with villagers (n=1460) and Forest Range Officers (FROs) (n=79), respectively, from 16 Forest Divisions. From the identified nine high conflict areas, we conducted ecological survey (213 survey transects (2km) across 113 100km<sup>2</sup> grids), to ascertain the effect of anthropogenic pressure on large carnivores.

**Results:** We found that livestock predation risk by large carnivores were driven by the size of livestock, dependency of local people on forest, topography, proximity to water body and the forest boundary, precipitation, and forest cover. We identified that tiger and dhole occupancy were highest where large and medium-sized preys were abundant. However, leopards utilized the available small-sized prey species and fragmented forest areas. Higher occupancy of large carnivores was found in contiguous forests, with abundant water resources and decreased towards the areas with high human disturbance. Over 50% of the FROs reported an increase in human-wildlife conflict incidents for the past five years. There were no variations in the mitigation measures employed in PAs and outside PAs, however the fund availability was more insufficient RFs than in PAs.

**Conclusion:** Our results suggest improving the habitat quality and connectivity in the existing forest, to minimize the risk of HCC. Our HCC hotspot and occupancy maps will help the policy makers to prioritize the mitigation measures for effective management of HCC.



# Modeling the effect of top predators and habitat on the distribution of mesocarnivores in large-carnivore landscapes of India and central Europe

**-Mr.Ashish Kumar**

**Aim:** The population size of striped hyaena (*Hyaena hyaena*) has experienced unprecedented rates of decline over the last few decades due to human persecution (poisoning), diseases and habitat loss. Western Eastern Ghats of Tamil Nadu (WEGPTN) holds a small population of striped hyaena. The population is the last remaining major breeding population of the entire southern India. We have studied habitat selection, den site preference, stress level and people's perception for hyaenas to devise conservation strategies.

**Location:** Western Eastern Ghats of Tamil Nadu

**Methods:** To study habitat selection by hyaenas, we have conducted camera traps and indirect sign surveys to collect data on occurrence of species, its sympatric species, their prey. We calibrated habitat suitability model using random forest algorithm accounting different bio-geoclimatic variables along with our field data. Den site selection was studied by collecting and analysing different habitat parameters collected from identified dens of hyaena and from alternative points, through Bayesian generalized linear model. To study stress level in the population, glucocorticoid concentrations were extracted through non-invasive method and were quantified. People's perception was assessed by conducting socio-economic surveys and analysing data under random forest framework.

**Results:** We found hyaena population to be confined to 314 sq. km area in the landscape. Hyaenas were found to prefer open arid habitat which is sub-optimal for large predators and act as a competition refugia. Our model on den site selection suggested that hyaenas select rocky refugia surrounded by trees and tall grasses, situated on mountain slopes proximate to water bodies. We got 30 scat samples for stress level analysis and we found that adult and female were more vulnerable to high glucocorticoid concentration. Hyaenas were found to cause negligible livestock damage but despite this disproportionate intolerance was observed among people due to generalization of threat.

**Conclusion:** The confined population is vulnerable to extinction and needs prompt conservation actions to establish meta population for its long-term conservation

## **Project Title:**

Determining the effect of Socio-ecological forces shaping hyaena population in the Western Ghats parts of Tamil Nadu, southern India

## **Principal Investigator(s):**

Dr. T. Ramesh

## **Researcher(s):**

Mr. Ashish Kumar (PhD Scholar)

## **Funding Agency:**

Science & Engineering Research Board, Department of Science & Technology, Government of India

## **Project Duration:**

3.5 years

## **Keywords:**

Habitat suitability model; stress level; den site selection; people's perception; random forest

## **Twitter Handles:**

@ashishtf

## **Tweet:**

Socio-ecological forces shaping striped hyaena population

**Project Title:**

Taxonomic characterization of select Galliformes of India using feather morphometrics and DNA for application in wildlife forensics

**Principal Investigator(s):**

Dr. Ashutosh Singh

**Researcher(s):**

Ms. Bhawani Sabat  
( Junior Research Fellow)

**Funding Agency:**

DST-SERB, Govt. Of India

**Project Duration:**

2 years

**Keywords:**

Galliformes, Feather characteristics, DNA database, Ethnozoology

**Twitter Handles:**

@moefcc, @wii\_india, @SabatBhawani27,  
@ashutosh\_7307

**Tweet:**

NA

# Taxonomic characterization of selected Galliformes in India using feather morphometrics and DNA for application in wildlife forensics

-Bhawani Sabat

**Aim:** To examine the variation in feather microstructures of selected Galliformes species in India and develop feather characteristics & mitochondrial DNA database for forensic use.

**Locations:** Samples were collected from Padmaja Naidu Himalayan Zoological Park, Darjeeling. However, questionnaire surveys were conducted in forest areas adjoining the Darjeeling city.

**Methodology:** Shed feathers were collected from five Indian Galliform species and four other Galliform species that are native to Southeast Asia and Europe during May to June 2023. Also, the degraded eggs were collected for generating DNA databases. Upon collection, feathers were segregated according to various feather types such as contour (body, wing, and tail), semiplume, downy, etc., and washed with 70% ethanol to remove foreign particles. For microstructural observations, under light microscope, slides were prepared using the dry and wet mount methodology. All the previously washed feather barbs were carefully placed over small drops of xylene on the glass slide and allowed to be air-dried. For dry mount, coverslips are placed directly over the barb samples, and the edges are sealed with nail varnish. However, for wet permanent mount, DPX mountant is used. Standard DNA extraction protocols were used for DNA extraction from the collected egg samples.

**Results:** Under the light microscope, distinctive ring-shaped structures and spined nodes are observed on the nodes of plumulaceous barbs of body contour feathers of the Indian Peafowl. The presence of hooklets, ventral teeth, and cilia is also observed on the pennaceous barbs of contour feathers. However, the light microscopic feather characterization of other species, DNA sequencing for cytb, 16s rRNA, and 12s rRNA are underway.

**Conclusion:** Presence of the distinctive ring-shaped structures can be used as an identifying feature for Indian Peafowl feather seizure cases. In addition, the ethnozoological data collected during the questionnaire survey provided information on the medicinal use of Galliformes species by the indigenous tribes for curing various ailments.

# Disentangling the functional role of vertebrate scavengers at carcass dump sites in the Western Aravalli hills of Haryana

-Hitesh Kumar

**Aim:** The global decline of vertebrate scavengers in the anthropocene has raised concerns about ecosystem health and balance. Ecological insights on scavenging of domestic and wild mammal carcasses by obligate and facultative wild scavengers has been overlooked in India.

**Location:** Western Aravalli hills in Mahendergarh and Rewari districts of Haryana

**Methods:** We determined the scavenger guild, richness and composition at single carcasses and common dump sites managed by the local authorities of the Gaushalas (cattle shed) using camera-traps. We estimated the probability of complete scavenging at single carcasses using Kaplan-Meier and Cox regression analysis. We examined local people's perception and knowledge related to vertebrate scavengers and assessed the socio-demographic traits and the man-animal conflicts that influence their perceived value of scavengers' ecosystem service provisioning index, and their functional importance via scavenging services.

**Results:** We recorded 21 vertebrate species (mammals, birds and reptile) at carcasses. Feral dog, golden jackal and striped hyena were the most commonly recorded scavengers in camera-traps and based on the ecological knowledge of 121 respondents. A large proportion perceived vultures and raptors as beneficial for their scavenging services and existence value, while mammals (feral dog, Indian leopard, striped hyena, and wild boar) were perceived as beneficial and harmful due to livestock predation, human attack, and crop damage. Overall, carcasses were completely consumed on an average in 7 days, indicating that facultative scavengers are providing ecological functions through carcass scavenging in areas that lack obligate scavengers. Scavenger richness decreased at advanced and dry decay stage. Carcass body size significantly influenced the probability of complete scavenging where small sized carcasses took fewer days to degrade than larger carcasses.

**Conclusion:** Carcass provisioning through carcass disposal practices by the local agro-pastoral communities provides resource availability for a large facultative scavenger guild in semi-arid ecosystems of Northern India. Our findings show that scavenging is widespread and frequent in this system and has important functions by building links in the food web. Our findings guide conservation and management priorities by considering the differences in local people's perception and awareness of scavengers.

## Project Title:

Functional ecology of the Vertebrate Scavenging Community in the Western Aravalli Hill Range of Haryana

## Principal Investigator(s):

Dr. Riddhika Ramesh

## Researcher(s):

Mr. Hitesh Kumar (Junior Research Fellow).

## Funding Agency:

CSIR JRF NET

## Project Duration:

5 years

## Keywords:

Carcass degradation, ecosystem services, scavenger richness, functional traits, tropical dry forest ecosystems

## Twitter Handles:

NA

## Tweet:

Terrestrial scavenging ecology for wildlife conservation and ecosystem health

**Project Title:**

Population status, Ecology, and Conservation of the Indian Swiftlet *Aerodramus unicolor* in the Western Ghats, West Coast and Offshore Islands of Maharashtra

**Principal Investigator(s):**

Dr. Manchi Shirish S.

Dr. Goldin Quadros

**Researcher(s):**

Ms. Dhanusha J. Kawalkar,  
(Senior Research Biologist)

**Funding Agency:**

Ministry of Environment, Forest and Climate Change (MoEFCC)

**Project Duration:**

4 Years (January 2020 – December 2023)

**Keywords:**

NA

**Twitter Handles:**

@ediblest, @indianswiftlet, @goldinquadros, @MahaForest, @SCONCoimbatore, @moefcc

**Tweet:**

The Indian Swiftlet, a highly specialized bird in the Apodidae family, is found in India and Sri Lanka. A survey conducted between 2020 and 2022 focused on breeding and foraging sites. The largest known colony is on Vengurla Rocks, with over 6,000 individuals. Climate change may limit the species' survival in the Southern Western Ghats of India and Sri Lanka, emphasizing the importance of breeding colonies for the species' survival.

# Status, distribution and conservation of Indian Swiftlet in Maharashtra

**-Ms. Dhanusha J. Kawalkar**

Swifts and swiftlets are specialized bird species that belong to the Apodidae family. The issue of species identification in flight and the inaccessible breeding locations has resulted in a lack of scientific attention to Apodids. We attempt to fill this lacuna by understanding the population status, distribution and conservation of the Indian Swiftlet in Western Maharashtra. The population status and distribution survey were conducted simultaneously between December 2020 and December 2022.

We surveyed all potential breeding habitats in Maharashtra's coastal districts to understand the population status. We also conducted a foraging survey to document the presence of the species at various locations in the study area. As an essential objective of the project, we tried to understand the conservation requirements of the species in the landscape. After locating the breeding site, we used the nest count approach to determine the breeding population.

The species is found breeding only on two islands of the Vengurla Rocks (Burnt Is. and Old Lighthouse Is.) of Sindhudurg district. The colony has >5000 birds and is currently the biggest known colony of the species. The distribution of the species in Maharashtra is restricted to the South Sindhudurg region. We also modelled the distribution using MaxEnt [Current and future (2050,2070)] based on the presence locations. The model predicts the presence of the bird from Central Ratnagiri to Kerala (AUC=0.96±0.02).

The primary factor influencing the distribution is the mean temperature of the warmest quarter. The predicted distribution of the species will be restricted to the southern Western Ghats of India and parts of Sri Lanka. It means the population in Maharashtra (Northern Western Ghats) might go extinct due to the changing climate, causing the loss of the largest colony of the species. This indicates the significance of the breeding colony in Vengurla rocks for the Indian Swiftlet's conservation. Further, integrating the findings into policy and decision-making can help conserve the Indian Swiftlet, listed in Schedule I of the Indian Wildlife Protection Act (1972).

# Power lines and birds: Recommendations for anti-collision measures with respect to power lines over Thane Creek Flamingo Sanctuary, Mumbai, Maharashtra

-Dr. Babu Rao, G

**Aim:** Power lines pose a serious threat to birds; this risk can be reduced by increasing the line visibility using line marking devices (Bird Flight Diverters-BFDs). However, the effect of power lines on birds and the efficacy of different BFDs is not adequately known from India. Therefore, we monitored the bird species composition and movements at Thane Creek of Mumbai where multiple power lines cross Thane Creek Flamingo Sanctuary to recommend suitable BFDs to minimise power line collisions as part of a short-term project funded by Tata Power Ltd.

**Location:** This study was conducted at Thane Creek Flamingo Sanctuary, Mumbai.

**Methods:** The vantage point count method was used to record the bird abundance and flight activity. Boat surveys and interviews were also conducted to estimate mortality and collision risk.

**Results:** Lesser Flamingos, Greater Flamingos and Shorebirds were the most abundant species. In total, 961 line crossings of 26 species were observed. The overall crossing rate was higher in House Crow, Black Kite and Whiskered Tern followed by Waders. Flight activity was found to be more in the safe zone (above and below the power lines). However, the Greater Flamingos and Lesser Flamingos are highly susceptible to collisions due to their morphological and behavioural traits. About 94% of questionnaire survey respondents reported witnessing Flamingo collisions with power lines during monsoon season. However, our carcass surveys failed to record any dead birds during the study period.

**Conclusions:** The studied site is under the constant influence of tidal cycles. As a result, there was a high probability that the missing the carcass during surveys conducted in the creek. Thus, we could not detect any dead birds during the survey. However, considering the short duration of our survey and the high probability of bird collisions reported during questionnaire surveys, the issue requires management interventions to minimize the bird collisions. Based on our field observations and a review of the literature, we recommend installing two types of BFDs viz., spiral type diverters in combination of Reflective type diverters (Rotamarka 3D diverter and reflective FireFly diverter) along the transmission line, which are expected to minimize the risk to birds from the power lines. Understanding the effectiveness and durability of bird diverters requires continuous long-term monitoring of birds in the area.

## Project Title:

Avifauna study for the proposed replacement transmission Lines of 110 KV Khopoli-Mankhurd and Khopoli-Chembur with reference to the Thane Creek Flamingo Sanctuary to suggest appropriate Bird diverters

## Principal Investigator(s):

Arun, P.R, Dr. Babu, S.

## Researcher(s):

Dr. Babu Rao  
(Senior Research Fellow)

## Funding Agency:

Tata Power Ltd., Mumbai

## Project Duration:

06 Months

## Keywords:

Power lines, Thane Creek, Flamingos, Bird Flight Diverters, Bird Mortality, Linear Infrastructure

## Twitter Handles:

@drprarun, @TataPower, @MahaForest

## Tweet:

Power lines and birds: Recommendations for anti-collision measures with respect to Thane Creek Flamingo Sanctuary

**Project Title:**

Assessing the anthropogenic pressure on the Critically Endangered White-bellied Heron *Ardea insignis*, its habitat and prey in eastern Arunachal Pradesh

**Principal Investigator(s):**

Dr. Vidyadhar Atkore

**Researcher(s):**

Kavin D (Junior Research Biologist)

**Funding Agency:**

DST-SERB

**Project Duration:**

3 years

**Keywords:**

White-bellied heron, fish diversity, environmental parameters, habitat quality, Eastern Himalaya

**Twitter Handles:**

@Kavin\_kd23

**Tweet:**

The untold food story of White-bellied heron.

# The current status of habitat quality and prey of White-bellied Heron (*Ardea insignis*) in Eastern Arunachal Pradesh

-Kavin D

White-bellied Heron (WBH) (*Ardea insignis*) is a Critically Endangered species, for which fish constitutes a significant proportion of diet (>95%). In order to understand WBH's feeding ecology, we studied its prey base i.e., fish. We assessed the fish assemblage patterns in the Namdapha Tiger Reserve (NTR) covering 54 segments inside the Protected area (PA) and 54 segments outside the Protected area (non-PA) and sites classified based on disturbance levels as low, medium, and high depending upon the degree of local threats encountered at each sampled river segment. The sampling unit was a 500 m river stretch within which there were two sub-samples comprising 250 m each. Multiple fishing gears were used to sample fish by following standard sampling protocol. We also measured the suit of riverine characteristics and water chemistry variables in each segment. We encountered one WBH during the winter survey in the core area of NTR.

Overall, we documented 68 fish species in the study area. Comparatively richness as well as fish count (1498) was higher in PA than the non-PA. Similarly, DO and pH were higher inside PA than outside PA. Along the disturbance gradient, fish richness and count were higher at the low disturbance gradient followed by a semi-disturbed gradient than at the high disturbance gradient. Among the water chemistry variables, richness showed a positive relationship with the water temperature while it did not show a clear association with other variables. Similarly, the fish count showed a positive relationship with water temperature and no clear association with EC, pH, and dissolved oxygen. Moreover, the dominant substratum was cobbles (mean  $37.42 \pm 13.19$  SD). Both richness and fish count declined with increasing stream velocity (m/s). Across habitat types, the highest fish richness and fish count was found in riffle habitat than other types. Interestingly, PA seems to harbor a higher fish diversity than non-PA. We encountered many anthropogenic threats outside PA that harm fish including electrofishing and sand mining. To protect WBH's habitat and its prey (fish) in the landscape, it is of utmost importance to engage local communities and find alternative solutions discussing with them and convincing them to adopt traditional methods of fishing to meet their sustenance thereby conserving riverine biodiversity.

# The Cormorant Oceanography Project: Exploration of the potential areas for tagging cormorant species along the east coast of Tamil Nadu, India

**-Mahendiran Mylswamy**

**Aim:** There is ample scope for bio-logging using diving birds. We aim to bio-logging cormorant species with solar-powered, network-connected (GSM) tags to measure in-situ environmental parameters in an aquatic system at foraging locations of cormorants.

**Location:** We surveyed cormorants from September 2022 to March 2023 along the east coast of Tamil Nadu, India.

**Method:** We adopted a road survey with a four-wheel drive along the east of Tamil Nadu, India.

**Results:** During the surveys, we recorded substantial distribution of Little Cormorants (*Microcarbo niger*) and Indian Cormorants (*Phalacrocorax fuscicollis*) widely along the coast and interior areas of Tamil Nadu. On the east coast, in the study area, we identified the abundance of cormorant species in more than 51 sites. However, during the survey, we could see the Great Cormorants (*Phalacrocorax carbo*) only at two sites, as they are winter migrants to the region. Additionally, the survey prompts us to propose specific testable hypotheses regarding the causes of breeding failure observed in recent years at some of these birds' erstwhile substantial nesting grounds.

**Conclusion:** We have identified some potential areas for bio-logging cormorants along the east coast of Tamil Nadu, namely the Rajakkamangalam River mouth near Nagercoil and Anjugramam Wetland in Kanyakumari districts, the Muthupet lagoon in Tiruvarur district, Centre for Advanced Study in Marine Biology, Parangipettai in Chidambaram district, the Muttukadu Estuary in Chengalpattu district.

## **Project Title:**

The Cormorant Oceanography Project – Expanded Research as Part of the Distributed, Autonomous, Scalable, Hydrographic Charting and METOC Sampling (DASHCAMS) DRI

## **Principal Investigator(s):**

Mahendiran Mylswamy,  
Rachael Orben, Adam Gabriel Peck  
Richardson, Alexa Piggott

## **Researcher(s):**

NA

## **Funding Agency:**

Oregon State University, USA

## **Project Duration:**

3 years

## **Keywords:**

Diving birds, in-situ estimation, bio-logging, marine, Cormorants, telemetry

## **Twitter Handles:**

@Mahenrose @RachaelOrban

## **Tweet:**

Exploring potential bio-logging sites for tagging cormorants along the coast of Tamil Nadu



**Project Title:**

A non-invasive approach to understanding the habitat use, activity regime, and movement ecology of Indian Rock Python, *Python molurus* from two select locations in India

**Principal Investigator(s):**

Dr Aditi Mukherjee,  
Dr Manchi Shirish S, Dr H.N. Kumara

**Researcher(s):**

To be recruited

**Funding Agency:**

DST-SERB

**Project Duration:**

3 years

**Keywords:**

Capture-recapture, Thermoregulation,  
Python-blotches, Site-fidelity, Movement

**Twitter Handles:**

@SACONCoimbatore, @ediblenest,  
@ForestRajasthan, @minforestmp

**Tweet:**

Tiger Stripes to Python Blotches! Join us for an interesting talk by Aditi from @SACONCoimbatore on elusive Indian Rock Pythons and their individual identification techniques

# Tiger Stripes to Python Blotches! – Non-invasive population assessment and monitoring protocols for Indian Rock Pythons

-Dr Aditi Mukherjee

**Aim:** In India, *Python molurus* (India Rock Python, hereafter IRP) is listed as a 'Schedule-I' species in the Wild Life (Protection) Act of India, 1972. The proposed study aims to assess and compare habitat use, suitability, and activity regime of IRP in two different biogeographic regions. We also aim to standardise an individual identification technique for IRP and assess their movement using non-invasive identification methods. The second and third objectives involve an experimental setup for standardising population monitoring protocols using photographic capture-recapture.

**Location:** The present study is conducted at two biogeographically distinct sites, Keoladeo National Park, Rajasthan (hereafter KNP) and the Jabalpur Forest Circle, Mandla District of Madhya Pradesh (MP). While the python population in the first study site (KNP) is subject to long-term research, the second study site of Mandla is highly important in generating new datasets about the species.

**Method:** Since the study is in its initial phase, we established contacts with the Mandla District Forest ranges during the first six months and collected secondary data on IRP sightings and their congregation sites from these 14 ranges of the Mandla Division. The systematic sampling for identifying the habitats used and occupied by the IRP began by gridding the study area (7544 sq. km) into 1 sq. km grids to locate and map the burrows, rocky crevices or other artificial structures used by pythons. The same grids were also for the questionnaire surveys to generate secondary information. We will also generate additional spatial information about types of terrain, digital elevation data, and distances to features like roads, water sources, agricultural fields, poultries and others to understand the distribution of IRP. To standardise individual identification techniques, movement patterns, and site fidelity of pythons in KNP, we will standardise an identification protocol to classify pythons individually based on their dorsal blotches. The proposed study will use the Camera Overhead Augmented Temperature (COAT) approach to individually identify IRP. The capture-recapture protocol will also give insights about the rescued and released IRP. Additionally, we will also understand the burrow-use behaviour and thermal ecology of IRP using thermal imagery, camera traps and burrow video cameras. A database of the dorsal blotch pattern of the pythons will provide detailed information on the population structure, movement pattern, and other life-history traits (immigration, emigration/dispersal, survival, and mortality rates) of the entire population in KNP, which could further act as a model for monitoring python populations in other areas.



# Assessment of fish diversity in Moyar river, Tamil Nadu

**-Vidyadhar Atkore**

**Introduction:** Freshwater habitats are highly threatened globally. Several measures to halt the biodiversity loss in freshwater habitats have been proposed by freshwater scientist. One of the measures is to generate empirical scientific information on the species diversity and species responses to environmental and anthropogenic threats.

**Method:** We assessed freshwater fish diversity in six river segments of Moyar river in Tamil Nadu state during June 2022. A river segment of 150 m was the sampling unit. At each segment, we measured a suit of river characteristics such as stream habitat, stream substrate composition (%), width (m), depth (m), canopy cover (%), stream flow (m/s), and recorded local threats such as washing clothes, vehicles, presence of barriers (check-dams) etc. Subsequently we performed fish sampling at each segments using local methods (castnet, dragnet, gillnets of different mesh sizes). All the sampled fishes were identified measured to their total body length (cm), photographed, and released back alive in the segment.

**Results:** We recorded 15 species of fish, of which 9 were endemic to the Western Ghats, Biodiversity Hotspots, India. Of all the segments, Mangalpatti was richest with 11 species followed by Jagalikaladavu, Kargudi, and Thengumharada with five species each. The body size of fishes ranged from 1.5 cm to 140 cm (avg 9.82 cm). Fish richness was positively correlated with water temperature and negatively correlated with electrical conductivity (EC) and total dissolved solids (TDS). Similarly, the fish count was positively correlated with water temperature while negatively correlated with EC, TDS and dissolved oxygen.

**Conclusion:** River Moyar harbours many endemic fishes of the WG region in India. This study encountered two critically endangered species i. e., Nilgiri Mystus (*Hemibagrus punctatus*) and the hump-backed mahseer (*Tor remadeviae*) and an endangered Nilgiri barb (*Hypselobarbus dubius*) in Mangalpatti and adjoining segments. In future, subsequent surveys are planned to collect seasonal data, habitat and flow requirements of these species.

## **Project Title:**

Monitoring freshwater fish population in selected Indian landscapes with reference to the changing climatic variables

## **Principal Investigator(s):**

Vidyadhar Atkore

## **Researcher(s):**

Kavin D (Junior Research Biologist),  
Vaishali V (Student Intern)

## **Funding Agency:**

MoEFCC-WII

## **Project Duration:**

4 years

## **Keywords:**

fish, river habitat, critically endangered, endemic, river characteristics

## **Twitter Handles:**

NA

## **Tweet:**

Endemic fishes are imperilled in due to human activities in Tamil Nadu part of WG, India

**Project Title:**

Rejuvenation of storm water drains and restoration of holding ponds in Navi Mumbai Municipal Corporation area

**Principal Investigator(s):**

Goldin Quadros

**Researcher(s):**

Prathamesh Gurjarpadhye,  
(Senior Research Biologist)  
Sunilkumar Gupta,  
(Junior Research Biologist)  
Siddhesh Bhave(Consultant)

**Funding Agency:**

Navi Mumbai Municipal Corporation

**Project Duration:**

September 2022 to November 2023

**Keywords:**

Manmade wetland, constructed wetland, mangroves

**Twitter Handles:**

@goldinquadros, @NMMCCOMMR,  
@MangroveForest, @MahaForest, @  
SACONEIACP, @moefcc#wetlands

**Tweet:**

Wetland rules can help in managing water holding capacity and provide habitat to support biodiversity in manmade/constructed wetlands.

# Restoration of holding pond in Navi Mumbai Municipal Corporation Area

**-Goldin Quadros, Prathamesh Gurjarpadhye, Sunilkumar Gupta, Siddhesh Bhave**

Holding ponds are an integrated drainage system that act as a retention basin in normal conditions and storage during high tides, thus helping avoid water logging. Since some regions of Navi Mumbai are located below the high tide level, CIDCO (City and Industrial Development Corporation of Maharashtra) opted for Dutch technology to control floods in the city. This method is used to control the ingress of seawater during high tides and allow excess water to flow into the sea during low tides naturally or by pumping with the help of high-capacity pumps during high tides. However due to lack of maintenance the water holding capacity of the pond has reduced coupled with growth of vegetation including the mangroves. Hence the objective was to facilitate the Navi Mumbai Municipal Corporation in restoration of the pond while following the Wetland rules 2017.

The study was undertaken in the holding pond (area 13.7 acres) located west of Panvel creek at Belapur CBD sector 12, Navi Mumbai (19°01.222'N and 73°02.788'E). The google imagery for the past two decades (2005-2022) was analysed to estimate the changes and growth of mangroves within the holding pond. While on ground, we plotted grids of 100 x 100 meters to document the diversity and abundance of mangroves.

We recorded eight species of true mangroves and two species of Non-Mangrove Halophyte with *Avicennia marina* as the dominant mangrove species. The google imageries revealed that prior to 2005 there were no mangroves within the holding pond, the mangroves established and grew rapidly since 2014 rapidly from 25% to the present 80%. This rampant growth resulted due to the non-functioning of the flap gates that helped in retaining the silt and reduction of the water holding capacity.

As per the Wetland rules manmade wetlands serving human purpose can be managed and maintained. Since the holding pond is a manmade wetland and within the CRZ I, it was suggested to desilt the pond to increase the capacity and carry out the maintenance of the other physical structures to restore the pond.

# Losers or Winners: Population estimation of blackbucks (*Antilope cervicapra*) in Narayanpet District of Telangana, India

-Bharti Arora

**Aim:** Blackbuck is an endemic dry grassland antelope to the Indian subcontinent and plays a critical role as prey for carnivores, i.e., Indian wolves and jackals in the ecosystem. Increasing availability of irrigational facilities especially lift irrigation, and mechanization of agriculture has contributed to crop substitution from rainfed crops to irrigated crops. The inadvertent changes by irrigation initiated a change in the land use land cover (LULC) across all districts in Telangana, leading to a decline in the numbers of blackbuck's natural predators. The encroachment into blackbuck suitable habitats has led them to stray into cultivated farmlands and feed on crops, resulting in substantial monetary damage to farmers. This study estimates the blackbuck population in the crop fields of current diversified cropping patterns in the Narayanpet district.

**Methods:** The data on population density, individual density, sex ratio, group size, and the age structure of the blackbuck were obtained between November 8, 2022, and November 22, 2022, using Rapid Vehicle Transect (RVT). A total area of 1180 sq Km was surveyed along the plantation tracks and metalled roads across five affected mandals (Krishna, Maganoor, Makthal, Utkoor, and Narwa) with diverse crop plantations in the mandals of Narayanpet with potentially high human-blackbuck conflict. The herd size, sex, and age class were recorded using the scan sampling method using binoculars as used in several behavioral studies.

**Results:** A total of 2068.54 blackbuck individuals were estimated in the region. The blackbuck's highest density was observed in a mixed habitat of cotton paddy and jowar with values of 1.08 and 0.8 groups per sq km, respectively. The sex ratio was found to be more female-biased across all the five affected mandals.

**Conclusion:** The first study on population estimation of the blackbucks in the district shows that they have fairly adapted well to the diversified cropping patterns. The traditional methods, i.e., human effigies, used sarees, fencing, guarding, guard dogs, etc., needed to be substituted with need HDPV, Solar, and biological fencing and community conservation followed by translocation plan for the species to ameliorate the damage

## Project Title:

Integrated management plan for human-blackbuck conflict in Narayanpet, Telangana

## Principal Investigator(s):

Dr T. Ramesh, Dr Riddhika Kale

## Researcher(s):

Dr Bharti Arora (Senior Project Associate)

## Funding Agency:

Telangana State Forest Department

## Project Duration:

6 months

## Keywords:

Distance sampling, human-blackbuck conflict, crop raiding, conflict mitigation irrigation

## Twitter Handles:

@moefcc, @wii\_india,  
Telangana Forest Dept.  
తెలంగాణకు హరితహారం

## Tweet:

Blackbuck population estimation in Telangana

**Project Title:**

Conservation of Great Indian Bustard (*Ardeotis nigriceps*) in Karnataka: Evaluating the population and ecological requirement of GIB in selected locations in Karnataka with special emphasis on Bellary Landscape

**Principal Investigator(s):**

Dr. H.N. Kumara, Dr. S. Babu

**Researcher(s):**

D. Deepak ( Junior Research Biologist)

**Funding Agency:**

Forest Department, Karnataka

**Project Duration:**

2 years

# Population status and habitat use by Great Indian Bustards in Siruguppa, Karnataka

**-H. N. Kumara**

A 'Critically Endangered' Great Indian Bustard is left with ~150 birds in Rajasthan, Gujarat, Maharashtra, Karnataka, and Andhra Pradesh. Once GIBs were recorded from the plains of Karnataka were thought locally extinct was later recorded from Siruguppa in 2006. We assessed the current distribution and habitat use by GIBs in Siruguppa between May 2020 and May 2022. Since the recordings of birds were occasional from one location, we collected the location-specific occurrence of species by interviewing the local people and predicted the possible spatial occurrence of species for Siruguppa. After identifying the potential sites, a team was built with local people and department watchers to search and monitor the GIB. Once the GIB was sighted, the information was sent to researchers and recorded the age, sex, number of birds, and their location. Later the birds were followed by maintaining a 200 m distance and recorded the location of the birds and activities. We sighted GIBs on 34 days of the 532 days of fieldwork. All the detections of GIBs were in 10 grid cells. Of the five forest lands in the study site, three of them had GIB presence and movement. Agasanur forest lands had 31% of all sightings. Although the birds were seen using crop fields, they spent 91% of the time in the grassland/scrubland. The maximum number of birds sighted on any single day was three (1 adult male and 2 adult females) in 2020 and 2021, but only two females in 2022. A 55-hour observation of the birds showed 47.7% of resting, 40.4% of foraging, 7.4% of movement, 2% of vigilance, and 0.4% of preening. The average area used by the birds was ~5.5 ha/day, and they maintained ~3.30 km from the villages. GIBs were observed flying to adjoining areas of Andhra Pradesh to the East. The Rollapadu Wildlife Sanctuary on the east had the only population of GIBs in recent times in the Deccan plateau but not detected in recent years. We suspect the GIB population in Siruguppa in Bellary, and Kurnool and Ananthapur districts of Andhra Pradesh is one that requires proper exploration

**Keywords:**

NA

**Twitter Handles:**

NA

**Tweet:**

NA

# Moving Towards Species Recovery: Gaur Reintroduction in Sanjay Tiger Reserve, Madhya Pradesh

-Ritesh Vishwakarma

**Background & Aim:** Gaur (*Bos gaurus*) is an ecological engineer and plays a crucial role in shaping vegetation structure, composition and maintaining ecosystem functionality. In the past, this large forest-based bovine faced challenges due to deforestation, land use change, poaching, competition with livestock, and disease transmission threats. The combination of these factors resulted in local extinction of the gaur within the Sanjay Tiger Reserve (STR) in 1996. Subsequently, the reintroduction initiative was planned with the goal of to facilitate the conservation-driven restoration of the gaur population within its natural habitat in STR. Reintroduction, as a conservation tool, seeks to restore viable species populations at its native range to establish a self-sustaining, free-ranging population. The success of reintroduction depends on the founder population, encompassing their health status, susceptibility and resistance to diseases, demographic condition, genetic diversity, and behavioural attributes.

**Location:** STR is situated in the north-eastern part of Madhya Pradesh. It is predominantly tropical dry deciduous forest that provides an excellent habitat for the gaur.

**Methods:** Evaluation of founders' health, followed by morphometric measurements, radio-collaring, and individual marking, were carried out. We performed a feasibility study using the stochastic population simulation model PVA to identify key demographic parameters for the proposed reintroduction program. Further, a suitability analysis was carried out based on the historical information on presence location.

**Results:** A total of 44 gaurs, 21 females and seven males from Kanha (250km away) and 13 females and three males from Satpura (650km away), were captured and translocated to STR in June 2023. Subsequently, animals were released in a soft release enclosure (30 ha) for one month to get acclimatized to the new environment.

**Conclusion:** A science-based conservation application and management can improve the success rate and increase the predictability of such a reintroduction program. The involvement of multiple stakeholders demonstrated the robust and effective conservation-based recovery of gaur in STR. The reintroduced gaur are being monitored closely to understand their ecology in STR.

## Project Title:

Gaur Reintroduction Plan 2023-28:  
Establishment of Gaur *Bos gaurus gaurus* in  
Sanjay Tiger Reserve, Madhya Pradesh

## Principal Investigator(s):

Dr. Parag Nigam,  
Dr. Bilal Habib

## Researcher(s):

Ritesh Vishwakarma  
(Senior Project Associate),  
Bhaskar Bhandari (Project Associate II)

## Funding Agency:

Madhya Pradesh Forest Department  
(MPFD)

## Project Duration:

Five Years (2023-28)

## Keywords:

*Bos gaurus*, Bovine-reintroduction, Habitat  
suitability, Local-extinction, PVA

## Twitter Handles:

@moefcc, @wii\_india, @moefcc,  
@wii\_india, @eventoed, @minforestmp,  
@Sanjay\_TigerR, @paragnigam09,  
@wildwithwolves, @TrKanha,  
@satpuratigrsr, @bhaskar\_bh1994,  
@IUCN\_WildCattle

## Tweet:

oving Towards Species Recovery:  
A vital step towards ecological balance  
and conservation of Gaur. Discover how  
science-driven initiatives are  
transforming Gaur's future in Sanjay Tiger  
Reserve. #ConservationSuccess  
#WildlifeRestoration.

**Project Title:**  
Elephant Cell

**Principal Investigator(s):**  
Ramesh Kumar Pandey, Dr. Parag Nigam,  
Dr. Bilal Habib, Dr. K. M. Selvan,

**Researcher(s):**  
Sh. Udhayaraj A.D. (GIS Specialist, Elephant  
Cell), Sh. Aditya Bisht (Consultant, PE)

**Funding Agency:**  
Project Elephant Division

**Project Duration:**  
March 2024

**Keywords:**  
NA

**Twitter Handles:**  
@moefcc, @wii\_india, @moefcc,  
@wii\_india, @paragnigam09,  
@wildwithwolves, @rameshpandeyifs

**Tweet:**  
Understanding the past and present status  
of the Elephant Reserves in India using  
LULC and elephant census data #Elephant-  
Conservation #Heritageanimal #conservation  
efforts

# Elephant Reserves in Changing Landscape

**-Aakriti Singh, SRF Elephant Cell**

**Aim:** To study the status and the issues relevant to Elephant Reserves  
Study Area: Elephant Reserves across India.

**Methodology:** The change in the LULC from 1985 to 2018 in the 33 elephant reserves in the country was done using pre-classified open-source remote sensing data. Broad comparisons between the years were made for all the five major LULC categories of the ERs to assess any major potential disparity between the years (1985, 1995, 2005, and 2018). Elephant census reports were collected for the year 2007, 2012, and 2017 to compare the elephant numbers across the country from the official website of MoEFCC.

Data on elephant deaths due to human- elephant conflict has been collected from the official website of MoEFCC and statistically interpreted.

## Results:

The Elephant Reserves (ER) are apprehended as management units for implementing management strategies to assist elephant conservation and at the same time, foster human-elephant co-existence in the shared landscapes.

They are essentially administrative (as opposed to legal) classifications; this is in contrast with tiger reserves, which are recognized under the Wildlife Protection Act. The ERs fall under four different biogeographic zones- the Western Ghats, Gangetic Plains and Himalaya – Central Himalaya zone, Deccan Peninsula zone, and the North East zone.

Between 1985 and 2018, an average of approximately 5% of forest cover has been lost overall while there is an increase of approximately 3% in the agricultural land. Around 10,790 km of road and 1340 km of railway line network passes through the ERs. The increased rail and road network has led to an increasing trend in Elephant deaths.

**Recommendations:** There is a need to provide a legal entity to the ERs similar to Tiger Reserves under the Wildlife Protection Act and intend to provide stricter on-the-ground and legal protection. As only 25% of the area of the ERs are under Protected Areas, there is hardly any protection for 75% of the ER area.

The change in the land use pattern in the ERs should be restricted; increasing agriculture on the forest edges and clearing of forest land for agricultural purposes is affecting the movement pattern of elephant populations

# Exploring New Home: Post-release Movement and Grouping Behaviour of Reintroduced Gaur (*Bos gaurus*) in Sanjay Tiger Reserve, Madhya Pradesh

-Bhaskar Bhandari

**Background & Aim:** As a part of conservation initiatives, a joint venture of the Madhya Pradesh Forest Department and Wildlife Institute of India successfully translocated 28 gaurs from Kanha Tiger Reserves (KTR). After hard release, individuals and groups exhibited exploratory behaviour irrespective of the habitat quality, foraging, and mate selection. The study aims to understand the initial range exploration, group dynamics, and movement patterns of the reintroduced gaur in Sanjay Tiger Reserve (STR).

**Study Area:** The STR lies in the north-eastern part of Madhya Pradesh, covering a total area of 1674 km<sup>2</sup>.

**Methods:** The study was conducted between 24 June to 23 August 2023 after the release of animals from soft-release enclosure. We performed exploratory circular distribution analysis and Kernel Density Estimator (KDE) of the reintroduced gaur population.

**Results:** The post-release monitoring revealed that both males and females had shown movement toward northwestern and north directions. However, n=3 males showed an eastward directional movement up to the Singrouli forest division. We observed higher movement in males compared to females; however, the groups used the release site intensively. From the release site, n=21 females showed a linear movement of 630 km within their exploratory range and an exploration of 411 km<sup>2</sup>. While males moved up to 1048 km and showed an exploration of 450 km<sup>2</sup>. The mean estimated home range of overall reintroduced population gaur was 592.65 km<sup>2</sup> (i95) and 76.44 km<sup>2</sup> (i50). Despite being captured from various herds within KTR, the animals exhibited herd formation, having mixed individuals of different natal identities.

**Conclusion:** During initial exploration, bi-directional movement was observed from STR to adjacent territorial forests in Chhattisgarh. Adult males exhibited long-ranging exploration than female gaurs. The 20 out of 28 gaurs, showed movement around the release site, representing the natural home range establishment within the STR.

## Project Title:

Gaur Reintroduction Plan 2023-28:  
Establishment of Gaur *Bos gaurus* in Sanjay Tiger Reserve, Madhya Pradesh

## Principal Investigator(s):

Dr. Parag Nigam,  
Dr. Bilal Habib

## Researcher(s):

Ritesh Vishwakarma  
(Senior Project Associate),  
Bhaskar Bhandari (Project Associate-II)

## Funding Agency:

Madhya Pradesh Forest Department  
(MPFD)

## Project Duration:

Five Years (2023-28)

## Keywords:

*Bos gaurus gaurus*, Establishment, Home range, Movement, Reintroduction

## Twitter Handles:

@moefcc, @wii\_india, @moefcc,  
@wii\_india, @moefcc, @wii\_india,  
@eventoed, @minforestmp,  
@Sanjay\_TigerR, @paragnigam09,  
@wildwithwolves, @bhaskar\_bh1994,  
@IUCN\_WildCattle

## Tweet:

Fascinating insights into the world of reintroduced gaurs in Sanjay Tiger Reserve, Madhya Pradesh! Discover their hyper-dispersal and exploration patterns in this pioneering study.  
#WildlifeConservation #GaurExploration #Reintroduction



**Project Title:**

Development of genetic database of captive elephants across India for welfare and management

**Principal Investigator(s):**

Dr. Samrat Mondol, Dr. Parag Nigam,  
Dr. Bilal Habib

**Researcher(s):**

Senior research fellow

**Funding Agency:**

Project elephant division, MoEF&CC

**Project Duration:**

2021-2024

**Keywords:**

Asian elephant, Microsatellite markers,  
Population management, Welfare, Wildlife  
trade

**Twitter Handles:**

@moefcc, @wii\_india, @moefcc,  
@wii\_india, @pacha\_ankit

**Tweet:**

Cousins to wild elephants, ~3k  
#captivegiants urgently need assessment  
for welfare and management. Individual  
level genetic data collated with physical  
parameters is one step towards  
generation of a uniform database for  
monitoring and conservation

# Genetic insights into captive elephant across India: a preliminary assessment

**-Ankit Pacha**

**Aim:** There are currently over 50,000 Asian elephants, and 25% of them are kept in captivity. India is home to one of the largest populations of captive elephants (n~3500) globally. Majority of these elephants are under private ownerships (65%) or are used by forest departments (26%) for patrolling and mitigation of human-elephant conflicts. The other 9% belong to zoos, circuses, and religious institution primarily for worship and cultural events. Recently, there have been reports of illegal live trade and poaching threat in captive elephants in India. In many cases, the origin of these captive elephants is unknown. Therefore, Project elephant division along with Wildlife Institute of India decided to compile genetic database of all captive elephants along with their physical parameters for welfare and management purposes.

**Location:** 25 elephant captive states across India.

**Methods:** In the initial phase of the project, tamper-proof kits were prepared for sample collection from individual elephants. Gajah Suchana app was developed for collection of physical data of the captive elephants that have been sampled. We selected and standardized a set of 12 microsatellite markers to generate forensic quality data for assigning unique genotypes to all captive elephants. The genetic data generated was checked with CERVUS and population assignment was done using STRUCTURE and TESS.

**Result:** We received a total of 342 blood samples sent from 12 states. Out of them, 23% were captive born, 18.75% were wild-caught and 58.2% individual's origin was not known. Sex ratio was more female biased with 69.7% females. Our microsatellite panel gave a cumulative PID(sibs) score of  $4 \times 10^{-5}$  and PID(unbiased) score of  $1.6 \times 10^{-11}$ . Bayesian clustering approach showed four major population signatures namely, southern, central, northern, and north-eastern, predominantly.

**Conclusion:** The results indicate that captive elephants show mixed population signatures specifically from northeast and south. It corroborates with data in Gajah Suchana app regarding translocations of captive elephants. However, better management plans can be suggested after development of genetic database of individuals from remaining captive elephant states.



# Phylogeography and demography history of leopards (*Panthera pardus fusca*) in India based on mitochondrial DNA

-Supriya Bhatt

**Aim:** Leopard typifies the most widely distributed and adaptable member of the family Felidae. However, recent assessments indicate a ~80% decline across its historic range due to natural and anthropogenic pressure. Among Indian subspecies, *Panthera pardus fusca* has substantially lost around 72% of its former range and shares its habitat with high population density areas. However, there have been few molecular studies investigating intraspecific variation among the Indian leopard and those had been limited in geographic scope. Therefore, this study aims to address the broadscale phylogeographic structure and changes in the demographic history of the leopards in India based on non-invasive genetic samples.

**Location:** Leopard samples from different biogeographic zones Himalayas, Shivalik hills and Gangetic plains, Central India landscape and Eastern Ghats, Western Ghats landscape, North-Eastern hills and Brahmaputra flood plains, of India.

**Methods:** We sequenced partial mitochondrial fragments of NADH5, NADH4, and Cytochrome B for 225 individual leopards across India. The various genetic diversity statistics estimates were calculated using DnaSP, followed by population structure using BAPS, and demographic history was estimated both qualitative (DnaSP) and quantitative approaches (BEAST followed by DIYABC).

**Results:** We successfully amplified 1265 bp sequence from the three targeted mtDNA fragments for 112 individual leopards. We identified 46 haplotypes with high haplotype diversity ( $0.913 \pm 0.019$ ), and low nucleotide diversity ( $0.00343 \pm 0.01$ ). Bayesian clustering approach indicated no clear phylogeographic structure. Qualitative approaches indicated contrasting pattern for demographic expansion or selection. However, quantitative approaches indicated population decline in the last glacial maxima (~25000 years ago) followed by recovery in the mid-Holocene (~5000 years ago) then a steep decline in recent time (~200 years ago).

**Conclusions:** Despite severe habitat loss Indian leopards still retain high mtDNA genetic diversity. Their population demographic pattern shows similar decline trend in other large mammalian community during last glacial maxima. Further, detailed, landscape-level ecological studies on leopard populations will be critical for their future persistence.

**Project Title:**  
Phylogeography and population genetics of leopards (*Panthera pardus fusca*) in India.

**Principal Investigator(s):**  
Supriya Bhatt, Dr. Samrat Mondol

**Researcher(s):**  
Supriya Bhatt (DST-Women Scientist A)

**Funding Agency:**  
DST & WCT

**Project Duration:**  
2022-2024

**Keywords:**  
*felidae*, biogeographic zones, haplotype, population decline, last glacial maxima

**Twitter Handles:**  
@moefcc, @wii\_india, @bhatt\_supriya  
@IndiaDST

**Tweet:**  
Indian leopards, facing habitat loss, still possess high mtDNA diversity. Their population trend mirrors the decline in other large mammals during the last glacial maximum #conservation #biodiversity

**Project Title:**

Assessing fine scale distribution pattern, population and habitat status of Northern Swamp Deer (*Rucervus duvauceli*) across upper Gangetic Plains of North India

**Principal Investigator(s):**

Dr. Samrat Mondol  
Dr. Bivash Pandav, Dr. Parag Nigam, Dr. Bilal Habib, Dr. Dhananjai Mohan

**Researcher(s):**

Sohini Saha (Senior Research Fellow)

**Funding Agency:**

Ministry of Environment, Forest and Climate Change (MoEFCC)

**Project Duration:**

November 2019- September 2023

**Keywords:**

Grassland conservation, Herbivore genetic, Migratory patterns, Genetic health, Phylogeography and population estimation

**Twitter Handles:**

@moefcc, @wii\_india, @moefcc,  
@wii\_india, @Sohini\_S25, @ShrutarshiP

**Tweet:**

Functional connectivity in northern swamp deer population across fragmented, human-dominated landscape along Gangetic Plains, India- Migration is the key for species survival #deerecology #habitatfragmentation #populationconnectivity #movementroutes

# Migration is essential: functional connectivity and movement patterns of swamp deer along the upper Ganges

**-Sohini Saha**

**Aim:** The Indian subcontinent has witnessed disproportionate declines in large mammalian herbivore communities. This is evident in the case of the northern swamp deer (*Rucervus duvaucelii duvaucelii*) population residing in the upper Gangetic basin, which faces conservation challenges due to its presence outside protected areas and limited ecological information. This study focuses on primary information on swamp deer movement patterns and genetic status in this landscape showcasing the importance of the remaining patchy grassland habitats for their future survival.

**Location:** The study occurred in the upper Gangetic habitat, spanning from Jhilmil Jheel Conservation Reserve (JJCR) to the southern edge of Hastinapur Wildlife Sanctuary (HWLS). This area hosts the exclusive northern swamp deer habitat along the Ganges and marks the subspecies' westernmost global extent.

**Method:** Our research combined radio-telemetry and conservation genetics tools to understand migration patterns, population connectivity, genetic diversity, and inbreeding. We employed Bayesian (STRUCTURE, GENELAND) and non-Bayesian (DAPC) methods for genetic structure analysis, scrutinizing individual-level data for inbreeding. We radio-tagged two female swamp deer using the drive net approach in JJCR, Uttarakhand to uncover movement routes and vital stopover sites.

**Results:** Through genetic analysis, the study identifies 266 distinct swamp deer individuals. Further analysis uncovers the presence of two spatially-admixed genetic lineages with moderate heterozygosity ( $H_o=0.51$ ,  $SD=0.10$ ) and low inbreeding ( $FIS=0.128$ ) status. Multi-disciplinary evidence suggests that the swamp deer exhibit a preference for small, isolated grassland patches located between the JJCR and the HWLS during migration and are genetically connected. However, the southern region of HWLS exhibits early signs of genetic discontinuity, requiring immediate conservation attention.

**Conclusion:** The study suggests historical human settlement, river dynamics, and the species' migratory adaptability contribute to observed genetic connectivity. While findings are promising for the isolated swamp deer population, effective management is needed to ensure the landscape remains viable.

# Understanding the nutrient dynamics of seagrass meadows across the recently established Dugong Conservation reserve in Tamil Nadu, India

**-Srabani Bose**

**Aim:** Seagrass growth, abundance and morphology are strongly linked to available nutrient resources. It is crucial to understand the inter-relationships between nutrient load in the sediments and seagrass meadow characteristics. Thus, the present study is aimed to establish a link between the seagrass characteristics and sediment nutrient content in the Dugong Conservation Reserve (DCR), Tamil Nadu.

**Method:** We extensively surveyed the DCR, covering an area of 448 sq. km in North Palk Bay, Tamil Nadu. We sampled 10 transects of 10 km length spaced 5 km apart. Across 100 sampling stations, we gathered sediment samples and seagrass specimens using a Van-Veen grab. The sediment samples were analysed for Organic Carbon (OC), Organic Matter (OM), sodium (Na), potassium (K), and nitrogen (N) using the methods of Walkley & Black (1934), flame photometry, and Kjeldahl method. Species-wise seagrass shoot density was determined from the collected samples of mixed and single species meadows. Utilizing a Generalized Linear Model, we explored how shoot density and species richness responded to nutrient content.

**Result:** Nitrogen, phosphorus, and potassium showed significant correlation with seagrass shoot density. Sediment nitrogen concentration was negatively correlated, while phosphorus and potassium were positively correlated with shoot density. Nutrient content of sediment and species richness were negatively correlated. Apart from phosphorus, there was no other nutrient that contributed significantly to species richness.

**Conclusion:** We conclude that out of the six nutrients that were investigated, phosphorus, potassium, and nitrogen exhibit the most relevance to shoot density and only Phosphorus shows relevance to the species richness of seagrass meadows. Further research on how certain species respond to sediment nutrient levels is necessary to improve upon the current baseline information.

## **Project Title:**

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

## **Principal Investigator(s):**

Dr. J.A. Johnson, Dr. K. Sivakumar

## **Researcher(s):**

Ms. Srabani Bose (Project Associate),  
Ms. Garima Dhiman (Project Assistant),  
Ms. Chinmaya Ghanekar (Scientist-C),  
Ms. Sweta Iyer (Project Fellow),  
Mr. Sohom Seal (Phd Scholar VII),  
Dr. Oishinee Chakraborty  
(Project Scientist-I)

## **Funding Agency:**

National Compensatory Afforestation Fund Management and Planning Advisory Council, Ministry of Environment, Forest and Climate Change, Government of India

## **Project Duration:**

9 years (2016 – 2025)

## **Keywords:**

Shoot density, Species richness, Generalized Linear Model, Nitrogen, Phosphorus

## **Twitter Handles:**

@moefcc, @wii\_india, @moefcc,  
@wii\_india, @the\_sohom, @thegrassyfish,  
@OishineeC, @srabosapiens,  
@Swetalier4, @jajohny2013, @nehrupt,  
@CAMPAdugong\_WII, @ksivakumarwii,  
@tnforestdept, @Seagrass\_WSA,  
@SeagrassEcology, @IUCN\_PA

## **Tweet:**

Investigating nutrient dynamics in Tamil Nadu's Dugong Conservation Reserve! Unveiling the intricate relationship between sediment nutrients and seagrass meadow vitality

**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):**

Prachi Hatkar (Project fellow)

**Funding Agency:**

National Compensatory Afforestation Fund Management and Planning Advisory Council, Ministry of Environment, Forest and Climate Change, Government of India

**Project Duration:**

9 years (2016 – 2025)

**Keywords:**

benthic fauna, assemblage, seagrass habitats, Dugong

**Twitter Handles:**

@moefcc, @wii\_india, @prachihatkar1  
@ksivakumarwii @nehurutp  
@jajohny2013@GujForestDept  
@DugongProject @ProjectSeagrass  
@ISeagrass @DugongHub  
@CAMPAdugong\_WII

**Tweet:**

Understudied seagrass-associated fauna of the Gulf of Kutch, Gujarat: Monitoring critical dugong habitat assessment

# Spatial diversity of seagrass-associated macrobenthos in the Gulf of Kutch, Gujarat

**-Prachi Hatkar**

**Aim:** Benthic communities are vulnerable to pollutant exposure, so they are an effective indicator of environmental stress. The study aims to describe the benthic faunal assemblage pattern in seagrass meadows in the Gulf of Kutch to highlight.

**Location:** Surveys were conducted between December 2020 and April 2022 at four sampling sites, viz., Chank reef, Noru reef, Bhaidar Island, and Chusana Pir in the Gulf of Kutch, to assess the spatial diversity within the infaunal macrobenthos community of seagrass meadows.

**Methods:** Natural Geography inshore areas (NAGISA) protocol was followed for sampling. Benthic fauna in seagrass meadows was sorted, enumerated, and taxonomically identified using standard keys. Seagrass characteristics data such as species composition and shoot density were collected from the sampling locations.

**Results:** A total of 16 taxonomic groups, viz., Gastropods, Pelecypod, Polyclacophora, Scaphalopod, Crustaceans such as Tanaidceans, Cumaceans, Amphipods, Isopods, Stomatopoda, Sergestid, Anthozoa, Polychaetes, Nematodes, Echinodea, were recorded from (N=120) samples from the survey sites. Benthic fauna was dominated by molluscs, followed by crustaceans in the study area. Overall, 195 species were enumerated, viz., 105 gastropods, 65 bivalves, one polycophoran, 11 amphipods, three isopods, two polychaetes, two prawns, one shrimp, one anomuran crab, one brachyuran crab, and one cnidarian., the microbenthic analysis showed the presence of higher group diversity in seagrass vegetated areas compared to non-vegetated regions in the Gulf of Kutch. Macro-benthic density was higher in single-species meadows as compared to mixed-species meadows ( $p=0.06$ ). Bhaidar Island reported the highest abundance ( $373+524.3$  no/m<sup>2</sup>), whereas Chusana Pir showed the highest species diversity ( $5+7.3$ ) among the sites. The lowest abundance ( $212+243.6$  no/m<sup>2</sup>) and richness of benthic fauna were recorded at Chank ( $3+0.85$ ). Moreover, the macrofaunal diversity increased with increasing seagrass shoot density. Mollusc species like *Anachis terpsichore*, *Cerithium zonatum*, and *Euplica scripta* were dominant during pre-monsoon. In the post-monsoon phase, *Anachis terpsichore*, *Clypeomorus bifasciata* were the dominant species in all the sites.

**Conclusion:** We conclude that *Halophila*-dominated meadows, such as Chusana Pir and Bhaidar Island harbours higher benthic density. Long-term monitoring of faunal assemblages with respect to their temporal variation will help to understand habitat preferences.

# **A Multifaceted Distribution Patterns of the Endangered Arabian Sea Humpback Whale (*Megaptera novaeangliae*) in the West coast of India**

**-Sreelekha Suresh P C, Dr. Selva Bharath, Joshua Dharmaraj, Hanok Stephen, Dr. Nehru Prabakaran, Dr. J.A. Johnson.**

**Aim:** To study the distribution patterns of the endangered Arabian Sea Humpback Whale (ASHW) along the west coast of India.

**Location:** The study covers the west coast of India, including states like Gujarat, Maharashtra, Goa, Karnataka, Kerala, Tamil Nadu, and Lakshadweep Island.

**Methods:** We conducted survey at 35 key fishing areas along the West coast of India. These sites were specifically selected due to their importance as major fish landing centers, characterized by a substantial presence of deep-sea fishing operations encompassing both adjacent coastal and deeper sea regions. To encompass a wide geographical area and identify regions with high marine mammal activity, a unique grid-based sampling approach was employed, utilizing a grid size of 20×20 km and extending 200 km from the coastline. Surveys were conducted using translated survey questions and field assistants proficient in local languages. ID cards featuring marine mammals aided in their identification.

**Results:** Out of 35 major fishing harbours, 27 sites have been successfully surveyed. The study reveals a 72.2% sighting rate of ASHWs across all seasons. ASHW sightings varied across seasons and states, with Gujarat, Maharashtra, and Karnataka having high winter sightings. Karnataka dominated in summer, while Tamil Nadu and Kerala had ASHW sightings during the monsoon. Hotspot areas were identified, including regions spanning Okha to Porbandar (Gujarat), Harnai (Maharashtra), Tenginagundi to Mangalore (Karnataka), Beypore (Kerala), and Chinnamuttom (Tamil Nadu).

**Conclusion:** The results emphasize the significance of implementing targeted measures, as hotspot areas have been identified for future acoustic analysis and boat-based surveys, enhancing our understanding of ASHW behaviours and distribution. Addressing threats like entanglement, ship collisions, and pollution is crucial to ensure the survival of these marine creatures.

## **Project Title:**

Pan India Assessment and Monitoring of Endangered Species under the Integrated Development of Wildlife Habitats (IDWH) - Arabian Sea Humpback Whale (*Megaptera novaeangliae*)

## **Principal Investigator(s):**

Dr. J.A. Johnson, Dr. Nehru Prabakaran

## **Researcher(s):**

Dr. Selva Bharath (Project Scientist – I), Mr. Joshua Dharmaraj (Project Associate-I), Miss. Sreelekha Suresh P C (Project Associate-I), Mr. Hanok Stephen (Project Assistant)

## **Funding Agency:**

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

## **Project Duration:**

18 months

## **Keywords:**

sightings, threats, entanglement, population size estimation, hotspot identification

## **Twitter Handles:**

@moefcc, @wii\_india, -@moefcc, @wii\_india, @SreelekhaSPC95, @selva0424, @AspieEthologist, @HanokStephen, @jajohny2013, @nehurutp

## **Tweet:**

Exciting findings! Study on Arabian Sea Humpback Whales unveils their distribution along India's west coast. Hotspots identified for future research & Conservation.  
#Marinemammals  
#Arabianseahumpbackwhale  
#westcoastofindia

**Project Title:**

Assessment of the ecological status of select Indian rivers for conservation planning

**Principal Investigator(s):**

Dr. Ruchi Badola, Dr. Syed Ainul Hussain

**Researcher(s):**

Sagar Sharad Chawan (Project Associate I )

**Funding Agency:**

NRCD Ministry of Jalshakti

**Project Duration:**

December 2024

**Keywords:**

Pollution assessment, Heavy metals, bioaccumulation

**Twitter Handles:**

@moefcc, @wii\_india

**Tweet:**

NA

# Ecotoxicological status of select Indian Rivers

**-Sagar Sharad Chawan**

**Aim:** : Under the aegis of NRCD, an intensive ecotoxicological study will be carried out in the selected five rivers of India, and the current pollution status will be assessed. The objective of this study is to evaluate the levels of pollutants such as heavy metals in the selected rivers Periyar River.

**Location:** Five rivers namely, Godavari, Periyar, Mahanadi, Barak, and Narmada flowing through the states of Maharashtra, Telangana, Andhra Pradesh, Kerala, Chhattisgarh, Odisha, Manipur, Assam, Madhya Pradesh, and Gujarat were surveyed and sampled for water quality and heavy metal pollution load assessment in the respective rivers.

**Methods:** The sampling and analysis were done using standard protocols and sophisticated laboratory instruments. Water quality was assessed on-site using a YSI multiparameter Handheld instrument and Heavy metals were analysed in the WII laboratory using ICP-MS.

**Results:** The results obtained after analysis, revealed fluctuations in river water quality parameters, such as temperature, pH, dissolved oxygen (DO), nitrate, turbidity, and total dissolved solids (TDS). Additionally, significant concentrations of heavy metals, such as lead (Pb), cadmium (Cd), mercury (Hg), chromium (Cr), and arsenic (As), were observed in the river waters. The elevated levels of heavy metals in these rivers stem from the discharge of industrial effluents from nearby industries, agricultural runoff, rapid urbanization, and other human activities. These heavy metals accumulate in aquatic organisms and can enter the food chain, posing various health-related risks.

**Conclusion:** Among the five rivers assessed, the Godavari and Periyar were observed to be the most polluted rivers. The purpose of the ecotoxicological studies is to generate baseline data on the pollution status of the river and offer regulatory authorities essential information for developing conservation and management plans for the biodiversity of respective rivers preserving the healthy ecological diversity of the rivers in the long term.

# Unveiling the importance of seagrass meadows as fish nurseries in Gulf of Mannar Marine National Park, Tamil Nadu

**-Chinmaya Ghanekar, Nehru Prabakaran,  
Sivakumar K., Johnson J.A.**

**Objective:** Seagrass habitats are widely acknowledged as crucial ecosystems for sustaining fish populations. The Gulf of Mannar (GoM) Marine National Park is a significant seagrass region in India but has limited understanding in terms of the significance to the regional fisheries. The objective of our research is to acquire a comprehensive understanding of the diversity, size distribution, and activity patterns of fish species associated with seagrass meadows of GoM.

**Location:** The study is conducted in Mandapam group of islands of Gulf of Mannar Marine National Park, Tamil Nadu, India which contains mixed habitats of seagrass, corals, algae, sand and rocky habitats.

**Methodology:** Fifty underwater point counts of 10 minutes each were conducted near four islands for seagrass associated fish assessment. Underwater stationary camera point counts were deployed at 10 selected stations. Artificial intelligence is being used for developing a tool for analysing camera points.

**Results:** Fish belonging to 24 families were observed in manual point counts in the sampling area. Family-wise fish density revealed that fishes belonging to Leiognathidae were found in the most dominant fish communities. Fish within the size range <5 cm showed the highest abundance. Observed fish activities in seagrass meadows included movement, passing by, feeding and hiding. Movement within the meadow was the predominant activity. Remarkably, around 25% fishes were feeding in the meadow confirming that seagrass serve as feeding ground for many fishes. Importance of seagrass meadows as shelter was highlighted as 12% fish were observed to be hiding in the meadow. Seagrass canopy usage by fishes was differential in various canopy layers. Around 70% of fish activities were observed in lower canopy i.e., space between seagrass leaves.

**Conclusion:** Seagrass meadows within the Gulf of Mannar region play a significant role as important nursery grounds for the associated ichthyofauna. Active fish foraging within the seagrass meadows, in conjunction with their utilization of the lower canopy, substantiates the role of seagrasses as feeding grounds and refugia for fish. Understanding this importance of seagrass is essential for effective conservation management of the GoM Marine National Park.

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

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

**Researcher(s):**  
Chinmaya Ghanekar

**Funding Agency:**  
CAMPA, DST

**Project Duration:**  
2016-2025

**Keywords:**  
Point count, size class, activity, seagrass canopy

**Twitter Handles:**  
@moefcc, @wii\_india, @moefcc,  
@wii\_india, @thegrassyfish, @nehtrup,  
@ksivakumarwii, @jajohny2013,  
@CAMPA dugong\_WII, @tnforestdept,  
@GulfofMannarMNP

**Tweet:**  
Dive into the green nurseries of the sea!  
Join us as we reveal the underwater wonders of #GulfofMannar!  
#SeagrassSecrets #FishyBusiness



**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, MoEFCC

**Project Duration:**

2025

**Keywords:**

NA

**Twitter Handles:**

@moefcc, @wii\_india, @sumit\_1995,  
@srabosapiens, @OishineeC, @nehrupt,  
@ksivakumarwii, @ajohny2013

**Tweet:**

Plunging deep into the Andaman and Nicobar Islands waters to know more about the biodiversity of the seagrass habitats, behold!

# Lesser-known fauna: Seagrass-associated macrobenthos in a tropical insular system

**-Swapnali Gole**

**Aim:** The tropical seagrasses of the Andaman and Nicobar Islands (ANI) alone support > 60 % of total seagrass-associated faunal species in India. However, fauna beyond mega species is seldom quantified, and the underlying ecological patterns remain unexplored. Our study investigated the critical environmental and biological determinants driving Macrobenthic community structure across the Andaman and Nicobar Islands.

**Methods:** Macrobenthos diversity and distribution were assessed using line-intercept transects (50 m) on foot for intertidal and SCUBA-aided in subtidal meadows. Across 66 meadows, we hand-scooped infauna sediments (n=9/ site; total= 390) from upper 10 cm soil (20 X 20 cm area). Epifaunal data was collected, intercepting the LIT by 0.5 X 0.5 m<sup>2</sup> quadrat (11 points/ transect; total=1251). We used a combination of non-parametric tests (Man-Whitney U and Kruskal-Wallis tests) and Gaussian regression analysis to check for the influence of potential predictors on macrofaunal densities.

**Results:** Infaunal and epifaunal groups recorded were 10 and 13 respectively, across the depth gradient (0.2 to 21 m). Mean infaunal and epifaunal densities varied from 46.8 ± 49.2 ind./m<sup>2</sup> to 94.5 ± 125.9 ind./m<sup>2</sup>, respectively. Dominant infaunal and epifaunal guilds were polychaetes (138 ± 145.5 ind./m<sup>2</sup>) and gastropods (410.2 ± 65.3 ind./m<sup>2</sup>). We observed vegetated habitats to support higher macrofaunal densities than bare regions. Water depth was the primary determinant for infaunal polychaete densities ( $\beta$  estimate- -0.454786; p- 0.03) and crustaceans ( $\beta$  estimate- -0.49672; p- 0.03). Furthermore, non-epiphytic algae positively influenced infaunal polychaetes whereas crustaceans showed negative correlation with silt. Infaunal gastropod densities significantly reduced in hard substrata such as rubble ( $\beta$  estimate- -0.31324; p- 0.00666). Infaunal crustaceans were the only group that negatively correlated with seagrass shoot densities.

**Conclusion:** The species richness of seagrass in the meadows played a regulatory role on epifauna but not infauna, while seagrass species identity did not influence Macrobenthic densities. We imply that seagrass presence, habitat variability, sediment profile, and water depth are the key variables influencing macrofaunal abundances from the studied meadows. This first baseline on seagrass macrofauna contributes to the research and management of seagrasses in ANI.



# Tracking a globally threatened scavenger: Unraveling the movement patterns of White-rumped vulture in Kangra, Himachal Pradesh

**-Malyasri Bhattacharya**

**Aim:** The population of critically endangered White-rumped vultures, has declined by 99.7% to less than ten thousand individuals in the wild. Once abundant in Asia, they are now limited to only few areas across India. Although captive breeding programmes are underway, there is a lack of knowledge regarding movement dynamics. The study aims to fill knowledge gaps in the species movement ecology.

**Location:** Kangra, Himachal Pradesh, India

**Methodology:** Five White-rumped vultures were captured using walk-in ground noose carpet from feeding sites at Kangra. They were tagged with E-OBS GPS/GSM tags using thoracic X-strap harness. Locations were collected for two breeding seasons from September 2021 to July 2023. The home ranges of vultures were analyzed with relation to breeding time using aKDE (autocorrelated Kernel density estimation) in Moveapp ver 0.9 (3).

**Results:** Seven breeding sites and 16 feeding stations were identified. Most of the vultures were confined to Kangra except a few with seasonal movement towards other states like Jammu & Kashmir, Haryana, and Punjab. Two of the tagged vultures were recorded breeding at same nesting sites. The home-range estimates have shown breeding adults have a smaller home range than non-breeding adults, which suggests a possible differential use of food resources, particularly the sub-adults who have explored different faraway feeding sites. The mean home range of all the individuals found was 1924 Km<sup>2</sup> for non-breeding and 1027 Km<sup>2</sup> for breeding season. For all the seasons, breeding adults have a home range of about 1311 Km<sup>2</sup>, whereas non-breeding adults have home range of 2156 Km<sup>2</sup>.

**Discussion:** Movement ecology research has played a crucial role in identifying vulture breeding sites and highlighting the importance of appropriate open carcass disposal sites in Kangra. The identified sites require protection against threats like powerline collisions, forest fires, and habitat degradation. This endeavor contributes significantly to the realization of national vulture conservation action plan's (2020-2025) objectives, as it aids in the identification and establishment of vulture safe zones, thereby securing vulture population.

## **Project Title:**

Ecology and Recovery of critically endangered Vulture species in Pong Dam Protected Area (PA) and its Eco Sensitive Zone (ESZ) in district Kangra, Himachal Pradesh

## **Principal Investigator(s):**

Dr. Gautam Talukdar, Dr. R Suresh Kumar

## **Researcher(s):**

Ms. Malyasri Bhattacharya  
(Junior Research Fellow)

## **Funding Agency:**

MoEFCC, R & D

## **Project Duration:**

2020-2023

## **Keywords:**

breeding, movement, home range

## **Twitter Handles:**

@moefcc, @wii\_india, @moefcc,  
@wii\_india, @MalyasriB,  
@reginaldroyston@moefcc, @wii\_india,  
@WildlifeHpfd

## **Tweet:**

Vulture Project, HP, tagged five White-rumped Vultures from Kangra. The results presented in IARS showed that they are confined to district Kangra except a few with seasonal movement towards other states like, J&K, Haryana, and Punjab. #SavesVulture

**Project Title:**

Ecological and Phylogenetic Aspects of an Avian Aerial Insectivore: The Barn Swallow in the Himalaya - NMSHE Phase II

**Principal Investigator(s):**

Dr. R Suresh Kumar, Dr. S. Sathyakumar

**Researcher(s):**

Amarjeet Kaur (Research Affiliate-NMSHE II & SRF DST-Inspire Fellow)

**Funding Agency:**

DST

**Project Duration:**

2022-2027

**Keywords:**

Species distribution limits, Geographic Barriers, Phenotypic variation, Climatic influence

**Twitter Handles:**

@moefcc, @wii\_india, @amarjeet\_kaur10

**Tweet:**

The strong elevational, latitudinal & climatic gradients of the Himalaya influence the Species distribution limits. This study shows how these variations result in differences in populations of a long-distance migrant, Barn Swallow in the Himalaya.

# Population-level structuring of Barn Swallows across the Himalayas based on morphological traits

**-Amarjeet Kaur**

**Introduction:** The distributional limits of species are influenced by a combination of physical, historical, and biotic factors, resulting in demarcation of borders in cases of closely related or ecologically similar species. Based on the available information, two subspecies of Barn Swallows (*Hirundo rustica*) are known to occur along the Himalayas. However, there is no clear information on the distribution of these two subspecies and their morphological differences.

**Aim:** This study examined morphological differences among Barn Swallow populations across the Indian Himalayan Region and in the Imphal Valley of Northeast India. We hypothesized that the 2500 km Himalayan arc, characterized by strong elevational, latitudinal, and climatic gradients, fosters natural barriers, limiting the breeding distribution of Swallow subpopulations and resulting in discernible population-level differences.

**Methods:** We sampled eight sites spanning four States; Kashmir, Uttarakhand, North Bengal, Manipur, where a total of 160 adult Barn Swallows were captured and a set of morphometric characters were recorded. Using Principal Component Analysis (PCA), segregation in the swallow populations was determined. ANOVA test was performed to ascertain the significance of these differences, followed by post-hoc Tukey's test for multiple comparisons. The sexually dimorphic trait "tail streamer" was examined separately.

**Results:** As expected, male swallows exhibited longer tail streamers than females. The PCA resulted in two PCs that together explained 54.1% of the variability in the morphometric characters. PC1 was correlated with higher body weight, longer wings, tarsus, and head length while PC2 was related to augmented functional traits, having larger bill morphology. Birds from higher latitude were positively correlated with PC1.

**Conclusion:** Different subpopulations of Barn Swallow could be discerned based on morphological characters alone. Body size in the populations likely follow a latitudinal trend with swallows at the higher latitude (Kashmir) being larger than the ones at the lower latitude (Manipur). This study provides the first insights of Barn swallow populations of the Himalaya, and details the influence of varying geophysical and climatic attributes on the morphology. The presence of genome-wide differences is yet to be confirmed, and the genomic examination is currently underway.

# Morphological adaptations in the house sparrows along an elevational gradient in the Himalaya

-Renu Bala

**Aim:** Elevational gradients impact organisms in diverse ways, with low temperatures and partial pressure of oxygen at high elevations serving as potent selective forces that intricately shape the ecological dynamics and life-history traits of montane species. Birds use various strategies to cope with cold temperatures at high elevations, such as increasing body size, using plumage as an insulative layer, regulating metabolic rates, and altitudinal migration. We investigated whether house sparrows (*Passer domesticus*) show eco-physiological and morphological variation in response to changing environmental conditions along a 3200 m elevational gradient in the western Himalayas. Drawing insights from eco-physiological patterns, we hypothesized that sparrows at higher elevations would exhibit larger body sizes (Bergmann's rule), shorter extremities (Allen's rule), and a more insulative feather structure.

**Methods:** We captured sparrows at 13 sites (n = 169 individuals) from 300-3500 m in the Garhwal region of Uttarakhand State. Upon capture, sparrows were weighed and banded. We also took seven morphometric measurements: beak length, beak width, beak height, head length, tarsus length, wing length, and tail length. To assess for differences in feather structure, specifically the extent of downy section, we collected two contour feathers each from the same location on the dorsal and ventral sides of the body and examined them using Image J software. We tested the relationship of morphology and feather structure with elevation using linear mixed-models with sex as random effect.

**Results:** Morphometric traits such as body weight, wing length, and tarsus length exhibited significant increase with elevation, signifying an overarching trend of larger size at higher elevations. Moreover, we detected a significant shift in beak shape, with higher elevations favouring elongated, shallower beaks. The downy proportion of feathers increased with elevation although this change was observable in dorsal feathers only.

**Conclusion:** Our findings affirm that in the Himalayas, sparrows follow Bergmann's rule with increasing body size in colder, higher elevations. Moreover, the increased down proportion in dorsal feathers, subjected to greater environmental exposure, likely enhances their cold resilience.

## Project Title:

A comprehensive study on the Ecology and Population Status of a human commensal – the House Sparrow *Passer domesticus* in the Uttarakhand State

## Principal Investigator(s):

Dr R Suresh Kumar,  
Dr Dhananjai Mohan

## Researcher(s):

Renu Bala (Project Associate- I)

## Funding Agency:

Uttarakhand Forest Department

## Project Duration:

Three year ( April 2021 to March 2024)

## Keywords:

body size, feather structure, avian thermo-regulation, insulative layer, morphometric traits

## Twitter Handles:

@moefcc, @wii\_india, @Renu623,  
@ukfd\_official

## Tweet:

Exploring #SparrowAdaptations @Renu623 shared insights into morphological variations of house sparrows in response to changing environmental conditions across a 3200m elevational gradient in Garhwal region of Uttarakhand

**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 Project

**Principal Investigator(s):**

Dr. Gautam Talukdar, Dr. S. Sathyakumar

**Researcher(s):**

Deepali Bansal (Junior Project Fellow)

**Funding Agency:**

DST

**Project Duration:**

2022-2027

**Keywords:**

Soil respiration (SR), Ecosystem respiration (ER), herbaceous meadow (HM), sedge meadow (SM), Western Himalaya

**Twitter Handles:**

@moefcc, @wii\_india

**Tweet:**

NMSHE study suggests climate warming could elevate above-ground respiration, fostering ecosystem health. Alpine meadows may see enhanced net carbon uptake due to increased plant growth and respiration.

# Assessing Impacts of Experimental Warming on Respiration Rates in Alpine meadow, Western Himalaya

-Deepali Bansal

**Aim:** Alpine meadows in the Himalayas are known to store a considerable amount of organic carbon in their soil. These ecosystems are highly vulnerable to climate warming and may stimulate respiration rates leading to carbon-loss and positive feedback. To address the underexplored respiration dynamics under warming in these sensitive systems, this study aims to investigate the impacts of experimental warming on ecosystem respiration (ER) and soil respiration (SR) in alpine herbaceous meadow (HM) and alpine sedge meadow (SM) during the growing season in the Western Himalaya.

**Location:** The study was conducted in the alpine region of Gangotri National Park, Western Himalaya, India

**Methodology:** 18 Open Top Chambers (OTCs) were installed to simulate warming in HM & SM. ER & SR were measured using the LI-8100A Automated Soil CO<sub>2</sub> Flux System. Triplicate readings were measured from each plot during June and July 2023. Independent sample t-test was performed to analyze effects of warming on SR, ER, AT, ST and SWC. Respiration-temperature relationship was tested by fitting exponential function and Respiration-moisture relationship was tested by fitting linear function.

**Results and discussion:** We found that ER increased significantly by 16.1% and 51.4% under experimental warming in HM and SM, respectively. This increase was coupled with an increase in soil temperature by 15.9% in HM and 25.4% in SM. Soil moisture decreased under warming by 32.2% in SM only, explaining the water absorption behavior of sedge plants. No significant effect on SR was observed under warming, suggesting that the increase in ER was primarily due to an increase in above-ground respiration. These findings highlight that warmer conditions during the growing season can increase above-ground respiration, promoting ecosystem respiration.

**Conclusion:** The findings of the study indicate that climate warming could enhance above-ground respiration during the growing season, thereby promoting ecosystem respiration. Additionally, the alpine meadows may experience an increase in net carbon uptake because of increased plant growth and elevated respiration caused by warming. This study contributes to a better understanding of respiration dynamics within alpine ecosystems and their interaction with plant communities.

# Distribution pattern of invasive alien plants and impact of *Lantana camara* on soil and vegetation in Western Rajaji Tiger Reserve, Uttarakhand

-Sipu Kumar

**Aim:** This study aims to investigate the distribution pattern of invasive plants and the impact of *Lantana camara* on soil physico-chemical properties and vegetation in the different forest ranges of the Rajaji Tiger Reserve (RTR).

**Location:** The vegetation of RTR is classified as Tropical Moist Deciduous Forests. The study area is located in the Western part of RTR, Uttarakhand, India. All the forest ranges of Western-RTR were chosen to investigate the distribution pattern of dominant invasive species, whereas Chillawali, Dholkhand, Beribara, and Ranipur were selected for assessing the impact of *L. camara* on soil and vegetation.

**Methods:** The distribution pattern of dominant invasive plant species in the Western-RTR was analyzed using a combination of grid-based vegetation sampling and the MaxEnt algorithm. Soil properties (pH, EC, OC, OM, N, P, K, Ca, and Na) and vegetation plots (10 x10 m for trees and shrubs) were established in *Lantana* invaded and uninvaded sites, and the data was analyzed using Non-Metric Multidimensional Scaling (NMDS) and correlation analysis.

**Results:** *L. camara*, *Parthenium hysterophorous*, *Senna tora*, *Ageratina adenophora* and *Ageratum houstonianum* were found to be the most dominant invasive species in the Western RTR. Distribution pattern of *L. camara* and *A. houstonianum* was found to be spatially contiguous, whereas *P. hysterophorous*, *Senna tora*, and *A. adenophora* were randomly distributed. *L. camara* (4018.75±3.60/ha) had the highest density across different forest ranges, particularly in Dhoulkhand and Beribada. *Lantana*-invaded sites had higher pH (6.69 ± 0.29 pHw) levels but lower organic matter (1.91 ± 0.93%) and phosphorus (1.10 ± 0.57 ppm) content compared to uninvaded sites. The content of sodium (37.5 ± 11.81 kg/ha) and nitrogen (0.09 ± 0.013 mg/Kg) in *Lantana* invaded areas was also higher. Canopy cover was inversely proportional to *Lantana* density in invaded sites.

**Conclusion:** *L. camara*, *P. hysterophorous* and *A. adenophora* were the most widespread invasive species in the Western RTR. The results highlight the complex effects of *Lantana* on soil nutrients and their capacity to modify ecosystem functions and services. Our results suggest that controlling *Lantana camara* should remain one of the top management priorities along with the restoration of canopy cover.

**Project Title:**  
Ecological Impacts of Major Invasive Alien Plants on Native Flora in Rajaji Tiger Reserve, Uttarakhand

**Principal Investigator(s):**  
Dr. Amit Kumar, Dr. Navendu Page,  
Prof. Qamar Qureshi

**Researcher(s):**  
PhD Scholar

**Funding Agency:**  
DST-SERB

**Project Duration:**  
July 2020-Nov 2023

**Keywords:**  
Invasion, Parthenium, Restoration, Shiwaliks,  
Vegetation

**Twitter Handles:**  
@moefcc, @wii\_india, @moefcc,  
@wii\_india, @serbonline, @amitwii,  
@sipuwildlife

**Tweet:**  
WII studied invasive plants in Rajaji Tiger Reserve, Uttarakhand, funded by DST-SERB. *Lantana* had varied impacts on soil nutrients and native plants. Control and restoration are crucial!

**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):**

Dr. S. Sathyakumar, Dr. Abhijit Das

**Researcher(s):**

Junior Project Fellow

**Funding Agency:**

DST

**Project Duration:**

2021-2026

**Keywords:**

Climate change, Himalaya, amphibians, body temperature, elevation.

**Twitter Handles:**

@moefcc, @wii\_india, -@moefcc,  
@wii\_india

**Tweet:**

Exploring Amolops body temperature variation across elevation gradients in West Kameng, Arunachal Pradesh streams - vital insights for Himalayan ecosystem resilience. #AmolopsTemperatureStudy #HimalayanEcosystem

# Aspect of variation in body temperature of genus *Amolops* across elevation bands in the West Kameng Basin

**-Krishnendu Banerjee**

**Aim:** With the Himalayan ecosystem under the amplified impacts of climate change, freshwater habitats, particularly streams, face heightened vulnerability. Stream amphibians like *Amolops* are crucial indicators due to their specific habitat preferences and limited thermal tolerance. Members of this genus has adapted to the unique challenges of fast-flowing streams, making them highly specialized and reliant on stable thermal conditions. In this initial phase of the study, we aimed to investigate the effects of environmental covariates and disturbance levels on the variation in body temperature of *Amolops* sp. along elevation gradient in the west Kameng river valleys, Arunachal Pradesh.

**Location:** The study was conducted in four distinct sub-basins: Dirang, Nafra, Mandala, and Sangti of west Kameng river, Arunachal Pradesh.

**Methods:** Field- We conducted time-constrained nocturnal Visual Encounter Surveys (nVES) in streams within approximately 500 m elevation intervals, documenting body, air, substrate, water temperature and relative humidity. Psycho-hygrometer was used to measure body temperature of the individuals, as well as other environmental covariates such as air temperature, relative humidity, substrate, and water temperatures. Species presence, stream locations were recorded by GPS device. Analytical- Data were analyzed in R, employing Pearson's correlation, scatter plots, and regression analysis.

**Results:** Relative abundance of *Amolops* sp. across the survey sites was 52.3 %. Body temperature of *Amolops* (n= 50) showed mean of 18.2 °C (Minimum-12.3 °C, Maximum-22.5 °C). Elevation wise temperature varied where it showed a wider range of 13- 21 °C in between 1500-2000m. Body temperature is positively correlated with substrate ( $p < 0.01$ ,  $t = 9.14$ ), and air temperature ( $p < 0.01$ ,  $t = 2.68$ ).

**Conclusion:** Our study presents preliminary insights into body temperature variation in obligate stream frogs. The limited dataset from the initiation phase prevents definitive pattern identification to understand species abundance and relation with different covariates. To establish robust trends of multispecies thermal ranges in response to climate change in the Eastern Himalayas, future studies should encompass increased replicates, multiple species, additional elevation ranges.

# Population status and stream covariates influencing the abundance of anurans in the Western Himalayan landscape of Himachal Pradesh

**-Saurav Chaudhary**

**Aim:** We aimed to estimate the population density of a rare anuran *Amolops formosus* and abundance of other anuran species, particularly, in the Shivalik foothills of Himachal Pradesh. We also aimed to check the influence of seven stream covariates on the abundance and occupancy of anurans.

**Location:** The study was conducted in and around two protected areas of Himachal Pradesh namely Churdhar Wildlife Sanctuary (ChWS) having altitudes range from 1900 m to 3647m and Col. Sher Jung National Park (SNP), having an altitudinal range of 350m to 700m.

**Methods:** Nocturnal Visual Encounter Surveys were utilized within the ChWS, while a stratified random approach using quadrat sampling was applied in SNP. For density estimation of *Amolops formosus* in the ChWS, spatially explicit capture recapture approach was employed. Abundance estimation of the species, along with its correlation with stream covariates, was conducted using the N-mixture model.

**Results:** We identified 51 different individuals of *Amolops formosus*. The predicted linear density for the *Amolops* in the two surveyed streams was  $90.5 \pm 21.9$  and  $87.53 \pm 19.02$  individuals per km respectively. The estimated density using the Half-normal distribution was  $5.58 \pm 1.95$  and  $5.11 \pm 1.61$  individuals per hectare in the two streams respectively. Flow of water had a statistically significant negative relation with the abundance of *Amolops formosus*. Rest of the covariates were not statistically significant.

Seven species were detected from SNP and *Fejervarya* sp. was the most abundant among them. In SNP, salinity had statistically significant negative correlation with the abundance of all amphibians in the park followed by temperature which had significant positive relation with the abundance of four species.

**Conclusion:** This study showcases the application of SECR methods for monitoring the rare species like *Amolops formosus*, and examines influence of water parameters on amphibian populations in the Himalayas. The insights gained can advance our understanding of amphibian ecology and inform enhanced strategies for conserving these understudied taxa in the region.

**Project Title:**  
Basic Study Design of Biodiversity assessment for Himachal Pradesh

**Principal Investigator(s):**  
Dr. Salvador Lyngdoh

**Researcher(s):**  
Junior Project Fellow  
(Herpetological diversity)

**Funding Agency:**  
JICA

**Project Duration:**  
January 2021 - October 2023

**Keywords:**  
Abundance, *Amolops Formosus*, Flow, Salinity, SECR

**Twitter Handles:**  
[@moefcc](#), [@wii\\_india](#), [@SauravGintaki](#),  
[@Himalayanwolf1](#)

**Tweet:**  
Exploring the Western Himalayan Anurans' Secret Lives! We delve into the ecology of Himalayan anurans using stream covariates as factors, and unlocking nature's mysteries in this breathtaking region. An SECR-based approach for Himalayan stream frog



**Project Title:**  
Fifth Cycle of Management Effectiveness  
Evaluation of Tiger Reserves in India  
2022-23

**Principal Investigator(s):**  
Dr. Gautam Talukdar

**Researcher(s):**  
Ananya Das (Project Associate-II),  
Dr. Nasim Ahmad Ansari (M&E Specialist/  
Director, NITI Aayog) and Dr. Gautam  
Talukdar (Scientist-F)

**Funding Agency:**  
National Tiger Conservation Authority  
(NTCA)

**Project Duration:**  
2022-23

**Keywords:**  
MEE, Context, Process, Outcomes

**Twitter Handles:**  
@moefcc, @wii\_india, @moefcc,  
@wii\_india, @mimishinu

**Tweet:**  
Analysis of the four Management  
Effectiveness Evaluation (MEE) cycles  
reveals that all Tiger Reserves have an  
effective protection strategy, have largely  
complied with statutory requirements  
and have done a good assessment of their  
threats.

# Analyzing the Element-Specific Results of India's Tiger Reserves through Four Management Effectiveness Evaluation Cycles

-Ananya Das

**Aim:** This study was undertaken to understand how the Tiger Reserves across the country have been faring based on the performances of the six elements\* (context, planning, inputs, processes, outputs and outcomes) of the MEE framework for four evaluation cycles.

## \*Explanatory Note:

The six elements are assessment parameters for Tiger Reserves Management. The MEE framework includes consideration of design issues (context and planning), the adequacy and appropriateness of management systems (inputs and processes) and the delivery of Tiger Reserves objectives including conservation of values (outputs and outcomes).

**Location:** The study was carried out at PAN India scale covering eighteen Tiger states.

**Methodology:** For this study, the MEE reports of the past four (2010, 2014, 2018 and 2022) cycles of Tiger Reserves were consulted from the Wildlife Institute of India's website. An element-wise comparison of the four cycles was done, primarily using the available MEE data. Furthermore, data were acquired in varying formats from a wide range of sources, including questionnaires, websites, and research articles relevant to the management of Tiger Reserves.

**Results and discussion:** The result indicates that the element 'Context' is the best-performing indicator (with a mean score of 73.42%) while the element 'Process' had the lowest mean score of 66.59%. The headline indicators under 'Planning', 'Output' and 'Outcomes' are average-performing indicators. With the help of the MEE exercise, Tiger Reserves have been showing an overall improvement in their management effectiveness. All of them have an effective protection strategy, have largely complied with statutory requirements and have done a good assessment of their threats. However, many Tiger Reserves are facing challenges with respect to adequate manpower, adequate dissemination of information to the public and biotic interference in the core area.

Considering that the 'Outcome-based' management approach is considered as most pragmatic management approach, efforts need to be made to step up the performance of the five outcome indicators of the process. With the help of the MEE exercise, the participation of a range of relevant stakeholders should be enhanced for Tiger Reserves management, disseminate the findings of MEE and bring in appropriate changes in policy, governance and management to enhance the effectiveness of the management of Tiger Reserves.



# Navigating Himalayan Riverscapes: Investigating Freshwater Fauna, Biological Patterns, and Processes to Build upon Long-term Monitoring of Climate Change Responses

**-Himangshu Borah & Meghavi Purohit**

**Aim:** Freshwater ecosystems in the Himalaya are undergoing biodiversity decline owing to extensive habitat degradation, overexploitation, damming, and climate change. This study evaluates fish and macroinvertebrate diversity, distribution, and biological patterns across altitudes in West Kameng Basin. It also establishes long-term monitoring for breeding phenology and key traits, improving climate impact comprehension over time.

**Location:** The study was conducted in the West Kameng Basin of Arunachal Pradesh, encompassing an area of 3800 km<sup>2</sup>. The basin comprises three sub-river basins: Dirang, Tenga, and Bichom. The total length of Dirang River is approximately 92 km originating from the Sela pass and merges with the Bichom River downstream.

**Methods:** Sampling spanned November to May, encompassing elevations from 700 to 2500 m.a.s.l. The approach followed a downstream to upstream method for both fish and macroinvertebrates. Higher-order streams (4th and above) were sampled every 500 m; lower-order streams (3rd and below) were sampled every 200 m. Fish were captured with cast nets and indigenous gear, while macroinvertebrates were collected using D nets. The catch per unit effort (CPUE) was calculated as catch divided by hours fished per sampling site. Additionally, we conducted a comparative analysis of breeding phenology and key life history traits through extended monitoring in the Western Himalaya.

**Results:** Our results encompass 8 fish species and 46 macroinvertebrate families in the Dirang River and its tributaries. *Schizothorax richardsonii* dominated most sites with CPUE ranging from 0.08 to 3.06 kg/hr. Its Gonado Somatic Index (GSI), reflecting gonad weight to total weight, peaked at 6.07 in November and low of 0.14 in February, aligning with Western Himalayan Rivers trends. Among 854 macroinvertebrates, we identified 8 orders and 46 families. Baetidae (n=171), Heptageniidae (n=116), and Hydropsychidae (n=102) were dominant. Pollution-resistant orders suggest excellent water quality (82.47% EPT index), while site-specific differences relate to physicochemical parameters.

**Conclusion:** The study establishes baseline patterns for fish and macroinvertebrate distribution along West Kameng's elevation gradient. Long-term monitoring of biological traits like breeding phenology offers insights into environmental, anthropogenic, and climatic impacts on Himalayan freshwater fauna.

## **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 Project

## **Principal Investigator(s):**

Dr. S. Sathyakumar, Dr. J.A. Johnson

## **Researcher(s):**

Himangshu Borah (Project Assistant),  
Meghavi Purohit (Project Assistant),  
Aashna Sharma (Senior Project Associate),  
Vineet K. Dubey (Project Scientist)

## **Funding Agency:**

Department of Science and Technology

## **Project Duration:**

2021-2026

## **Keywords:**

NA

## **Twitter Handles:**

@moefcc, @wii\_india, @moefcc,  
@wii\_india, @Bikibora1,  
@PurohitMeghavi, @Aashna\_wildlife,  
@Vineet\_Climate, @jajohny2013

## **Tweet:**

Dive into the changing world of Himalayan freshwater ecosystems. We're studying fish and macroinvertebrate diversity and setting up a long-term monitoring on breeding phenology and crucial traits to decode climate change influences

**Project Title:**

Response to Anthropocene and Climate Change: Movement Ecology of Selected Mammal Species across the Indian Himalayan Region

**Principal Investigator(s):**

Dr. Bilal Habib, Sh. Pankaj Raina

**Researcher(s):**

Prasad Tonde(Senior Research Fellow)

**Funding Agency:**

NMHS - National Mission on Himalayan Studies

**Project Duration:**

2020 – 2024

**Keywords:**

Telemetry, Marmot, Ladakh, Movement metrics, Habitat use

**Twitter Handles:**

@moefcc, @wii\_india, -@bhlab\_india, @wildwithwolves, @wild\_xavierite, @shaheerkhan @NMHS\_PMU @WRRC\_LEH

**Tweet:**

Charming Himalayan Marmots: Dancing to Their Own Alpine Tune! Dive into the captivating world of Himalayan Marmots as we showcase their habitat use and movement patterns using radio telemetry data #telemetry #movementmetrics #IARS2023

# Weathering the Change: Insights into Himalayan Marmot Movement Patterns and Habitat Use

-Prasad Tonde

**Aim:** The aim of this study is to understand how Himalayan marmots navigate the evolving environment in Ladakh, analysing their movement patterns and habitat preferences using radio telemetry shedding light on their responses to changing conditions.

**Location:** The Union Territory of Ladakh, India.


**Methods:** Himalayan marmots were captured using a combination of modified Sherman traps and tranquilization, and fitted with 'LiteTrack 140 RF' radio collars. A total of five Himalayan marmots were collared. Movement data was gathered and movement metrics, home ranges distributions and overlap were calculated for four individuals. For habitat utilization, we extracted different Land Use and Land Cover classes using ESA LULC within home ranges and calculated the proportion used.

**Results:** Individuals with collar ID 33486, 33481, 33482 and 33483 have an average step length of 42m, 53m, 28m and 24m respectively. Maximum distance travelled from the burrow was for 33481 (377m). On an average, maximum time was spent within 8m of the burrow for 33486 (68%), 12m for 33481 (63%), 5m for 33482 (43%) and 10m for 33483 (35%). The home range estimates using 99% MCP for four marmots were 3.04ha (33486), 7.75ha (33481), 0.75ha (33482) and 0.12ha (33483). 33481 and 33486 showed an overlap of 1.39ha whereas 33482 and 33483 showed an overlap of 0.12ha. Habitat use analysis showed that among the collared individuals, primary land use varied: 33486 predominantly preferred Moss and Lichens areas (48% and 97%), 33481 preferred Grassland and Sparse vegetation areas (46% and 67%), 33482 occupied Sparse vegetation areas (82% and 67%) and 33483 preferred Sparse vegetation areas (65% and 98%).

**Discussion:** Resource rich seasonal pastures in high altitude regions shape the resource utilization pattern including space-use and step length. This makes the species more susceptible to the effects of climate change. In cases of climate change, alterations in productivity may have a more pronounced impact on species with limited habitat range compared to those with larger geographic ranges. Restricted night movement and no movement across colonies further exposes species to the risks of landuse and climate change.



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 wii\_india

 @wii\_india

 @wii\_india  
Koo



Wildlife Institute of India  
Post Box #18, Chandrabani  
Dehradun – 248001, Uttarakhand, India  
E-mail: [wii@wii.gov.in](mailto:wii@wii.gov.in)  
[www.wii.gov.in](http://www.wii.gov.in)



भारतीय वन्यजीव संस्थान  
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