भारतीय वन्यजीव संस्थान
Wildlife Institute of India

XIV INTERNAL ANNUAL RESEARCH SEMINAR

Tuesday, 11th September 2018

PROGRAMME

Seminar Chairperson: Shri V.K. Uniyal, Former PCCF, Kerala

INAUGURAL SESSION

0930 – 0935 h   Welcome

Dr. Ruchi Badola, Scientist-G, WII

0935 – 0945 h   Opening Remarks

Dr. G.S. Rawat, Dean, WII

TECHNICAL SESSION – I
STATUS AND DISTRIBUTION

Chair	**:**	**Dr. Pratap Singh, Scientist-G**
Co-Chair(s)	**:**	**1. Dr. R. Suresh Kumar, Scientist-E**
		2. Dr. Anju Baroth, Scientist-C

0945-1000   Status of golden mahseer (*Tor putitora*) population in River Kosi, Uttarakhand

Bhawna Dhawan, Junior Research Fellow

1000-1015   The status of fish diversity in Sahyadri Tiger Reserve, Maharashtra

Sutanu Satpathy, Project Biologist

1015-1030   Preliminary insights on the occurrence of waterbirds breeding colonies (Heronries) in the state of Tamil Nadu

Frank S J D, Junior Research Fellow

1030-1045	Feasibility analyses for tiger recovery in Sahyadri Tiger Reserve, Maharashtra

Shah Nawaz Jelil, Project Fellow

1045-1105	**Discussion & Remarks by Chair and Co-Chairs**
1105-1125	**Tea**

TECHNICAL SESSION – II
ECOLOGY AND BEHAVIOUR

Chair	:	**Dr. K. Sivakumar, Scientist-F**
Co-Chair(s)	**:**	**1. Dr. Bilal Habib, Scientist-E**
		2. Dr. K. Vishnupriya, Scientist-C

1125-1140	Dog is not a bird's best friend! Breeding distribution and proximate factors affecting nest success in four exclusively river-island nesting birds in the National Chambal Sanctuary, Uttar Pradesh

Rohit Jha, Project Fellow

1140-1155	Living in the Anthropocene: Space use and movement of Indian grey wolf

Shaheer Khan, Junior Research Fellow

1155-1210	**Discussion & Remarks by Chair and Co-Chairs**

TECHNICAL SESSION – III
TAXONOMY AND GENETICS

Chair	:	**Dr. P.K. Malik, Scientist-G**
Co-Chair(s)	**:**	**1. Dr. S.K. Gupta, Scientist-E**
		2. Dr. C. Ramesh, Scientist-C

1210-1225	Integrated Taxonomic approach in delineating herpetofaunal species richness in Panna Tiger Reserve, Madhya Pradesh

Vishal Kumar Prasad, Project Biologist

1225-1240	Understanding dhole population parameters through non-invasive approaches in Eastern Vidarbha Landscape

Shrushti Modi, Senior Project Fellow

1240-1255	What's in a Name? Addressing an identity crisis of Himalayan Torrent Frogs

Preeti Sharma, Junior Research Fellow

1255-1310	**Discussion & Remarks by Chair and Co-Chairs**
1310-1415	**Lunch**

TECHNICAL SESSION – IV
ANTHROPOGENIC DRIVERS AND IMPACTS

Chair   :   Dr. Bivash Pandav, Scientist-F

Co-Chair(s) :   1. Sh. Vinod Kumar, D.K., Scientist-D

2. Dr. Navendu Page, Scientist-C

1415-1430   Validation of stress and reproductive hormones for non-invasive health monitoring of wild tigers

Shiv kumari Patel, Junior Research Fellow

1430-1445   Assessing the impacts of Power lines on avian species in the arid plains of Western Gujarat

Vipin Rao, Project Associate

1445-1500   Undefined boundaries, prickly neighbours: some preliminary insights on human–elephant conflict in Chhattishgarh

N. Lakshminarayanan & Ankit Kumar, Project Fellows

1500-1515   **Discussion & Remarks by Chair and Co-Chairs**

1515-1535   **Concluding Remarks by the Seminar Chairperson**

1535-1540   **Vote of Thanks**

Dr. K. Vishnupriya, Scientist-C

1540-1600   **Tea**

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Status of golden mahseer (*Tor putitora*) population in River Kosi, Uttarakhand

-Bhawna Dhawan

Golden mahseer is a highly valued freshwater fish species with specific habitat preference and migratory paths along the foothills of the Himalayan Rivers. But over the past years, its population has been declined drastically due to habitat fragmentation and migratory routes have been obstructed due to developmental activities (hydro-power plant). The present study thus, was focused to understand the habitat condition, fish community structure and abundance of golden mahseer in Kosi River.

Study was conducted in river Kosi, one of the tributaries of river Ramganga that flows through Corbett Tiger Reserve and Ramnagar Forest Division. A stretch of 32km long river was surveyed, starting upstream from Kunkhet at Mohaan to Kosi Barrage in Ramnagar.

A total of 23 pool habitats were surveyed in a 32 km river stretch. At each pool habitat, river cross-sectional study was performed at every 5 m interval and variables like depth, velocity and habitat substratum were recorded at every 1 m interval. Water quality assessment was done by estimation of DO, pH, temp, EC and TDS. Fish sampling was performed using cast net in shallow run and riffle habitat and underwater observation was done in pool habitat. Golden mahseer population was estimated based on underwater count as well as photographic record. Habitat Utilization Co-efficient (HUC) has been evaluated for golden mahseer in Kosi River.

Mean depth, flow and volume of pool habitats were measured to be (0.91 ± 0.24m, 0.19 ± 0.41m/s and 411.76 ± 195.87 m³), average measures of water quality parameters were reported as DO (9.32 ± 0.49mg/L), pH (9.11 ± 0.46), EC (280.62 ± 45.90µS/cm) and water temp (23.92 ± 1.57ºC). Small-sized boulders and cobbles were the dominant substrate. Fifteen different species of fishes belonging to nine genera including golden mahseer were recorded. Fishes were found to be spatially segregated in pools. Being carnivorous big-sized fish, adult golden mahseer was frequented in deep pool habitats. Small individuals were found in shallow riffle and run habitat.

Pool habitats with reduced flow, high DO, alkaline pH, moderate temperature, small boulders and cobbles as substratum are the major predictors of high golden mahseer population density.

Key words: Habitat Utilization, pool habitat, abundance, aquatic environment

Project Title	:	Study on ecology and migratory patterns of golden mahseer (*Tor putitora*) in river Ganga using radio telemetry techniques
Principal Investigator(s)	:	Dr. J.A. Johnson and Dr. K. Sivakumar
Researcher(s)	:	Bhawna Dhawa (Junior Research Fellow)
Funding Agency	:	WII-Grant-in-Aid
Project Duration	:	3 years

Status of fish diversity in Sahyadri Tiger Reserve, Maharashtra

-Sutanu Satpathy

Fish diversity is a good indicator of the health of any aquatic system. In the Sahyadri Tiger Reserve, the major rivers, Chandoli and Koyna were both subjected to major landscape changes after the 1950's in the form of large dams for the purpose of electricity and irrigation. The aim of this study is to see how aquatic communities have segregated themselves in a region with both reservoirs and streams. Another major objective is to look at the health of fish communities for the first time since it was declared a Tiger Reserve in 2007.

Water bodies within the area vary from small seasonal streams to perennial rivers, to large reservoirs formed on the Koyna and Chandoli rivers, in Satara district and Bhogawati river in Kolhapur. The region comes under the biogeographic zone of northern Western Ghats, one of the biodiversity hotspots of India.

Sampling strategies varied, requiring the use of gill nets (mesh sizes: 2.5 cm and 5 cm), drag nets, cast nets (mesh size: 2 cm), and scoop nets. Gill net deployment was done by fisherman in deep waters (depth>2m), while researchers employed all other equipment in shallower pools and streams. Careful analysis of formalin-preserved specimens using reliable taxonomic keys was done. A cluster analysis of the presence-absence data of the sites was done to see which sites had comparable communities.

A total of 40 species (belonging to 28 genera and 13 families) were identified from 28 sites. 2 of the species were listed as Data Deficient in the IUCN list; *Hypselobarbus kolus* as Vulnerable; and *Tor khudree* (Deccan Mahseer) as Endangered. The cluster analysis showed that the reservoir communities were similar across seasons and sites, probably a result of the large, buffered ecosystem. In terms of segregation, one can clearly see that streams are dominated by loaches (*Bhavania australis*, *Nemacheilus evezardi*) along with barbs of the *Puntius* genus. On the other hand the reservoirs of the same river basin, are dominated by the Deccan Mahseer and Kolus.

Key words: Deccan Mahseer, Cluster analysis, Hydro-power Dam, Western Ghats

Preliminary insights on the occurrence of waterbirds breeding colonies (Heronries) in the state of Tamil Nadu

- Frank S J D

Colonial nesting waterbirds face major risks to their populations and its habitats. The present study as part of national atlas of colonial nesting waterbirds aims to strengthen the knowledge base by conducting a state wide survey in Tamil Nadu on the colonial nesting waterbirds and investigate associated threats.

The present study covers the entire state of Tamil Nadu which is divided into three broad physiographic regions western hilly region, plains along the coast, north western high elevation area.

Water bodies across the districts of Tamil Nadu were surveyed for the presence of waterbirds breeding colonies and information pertaining to nesting area, activity period in the nesting site, nest trees used, nesting species and conservation threats were collected during nesting season (October 2017- June 2018). Detailed photo documentation for the nesting sites and species were conducted.

From preliminary investigation a total of 41 nesting areas were identified as breeding sites. About 27% of the nesting sites (11 sites) are in protected area and 73 % in non-protected area. Twenty of the 26 waterbird species were found to be nesting in the existing sites in Tamil Nadu. *Acacia nilotica, Prosopis juliflora, Barringtonia sp, Bamboo sp, Azadiracta indica,* etc, were found to be major nesting trees.

Owing to removal of nesting trees, anthropogenic disturbances, changes in monsoon pattern and other multiple factors, numerous nesting sites which were active in the past have been lost. Some of the sites that were recorded during the observed season were new when compared with previous sites. Since most of the past sites are not active, there has been a major shift in distribution of nesting sites which creates a conservation challenge to identify such sites across the enormous waterbodies in Tamil Nadu.

Keywords: Colonies, Conservation, Atlas, Lakes, N-E Monsoon.

Feasibility analyses for tiger recovery in Sahyadri Tiger Reserve, Maharashtra

-Shah Nawaz Jelil

Tiger conservation is the cornerstone of Indian wildlife conservation. Tigers play significant roles in ecosystem functioning by controlling prey populations and eventually have effects on resulting forests. They, thereby maintain a balance in nature. Due to low density, recovery of tiger (*Panthera tigris*) in Sahyadri Tiger Reserve (STR) is being considered and efforts are being made by the Government of Maharashtra in collaboration with Wildlife Institute of India and National Tiger Conservation Authority, Government of India. To support the efforts, we evaluated the feasibility for tiger recovery in the landscape. We mapped habitat features and sampled vegetation characteristics (n=369 circular plots), prey density (n=41 line transect; 82 km), carnivore signs (n=72 survey routes, 384 km) and carnivore abundance (n=148 camera trap locations; 3636 trap nights). We carried out questionnaires (n=1034 respondents) among the local villagers in STR to understand social acceptance of tiger augmentation proposal by the Government. We could recognize seven forest classes, with dense forests and barren land being the major types. Habitat characteristics were estimated as: trees 14.93 (±7.72 SD) per plot, canopy cover 54.31% (±9.20 SD), and cutting signs 0.13(±0.31 SD), lopping signs 0.32 (±0.46 SD) and livestock dung density 0.76 (±0.73 SD). Prey density (per km2) was estimated as: wild ungulates (including gaur, sambar, barking deer and mouse deer) 9.5 (2.79 SE), livestock 10.81 (6.00 SE) and primate 11.18 (5.00 SE). Habitat suitability analyses for tigers estimated a 451 km2 area as potentially suitable. Twelve carnivore species were identified through camera trap surveys. Camera capture rates (per trap night) were maximum for leopards (0.02) and lowest for rusty spotted cat (0.0002). Tiger was captured in our camera traps recently in May, 2018. However there is indeed a lack of resident tiger within STR boundary. Household surveys revealed that 46.13% people accept tiger recovery project and are willing to support it whereas 53.87% people are not. However, given the local extirpation of breeding tigers, the habitat suitability including moderate prey base and people's acceptance, there is case for tiger augmentation to ensure a viable tiger population in STR.

Key words: Reintroduction, carnivore recovery, Northern Western Ghats

Project Title	:	Tiger Recovery Strategy and Long-term Monitoring in Sahyadri Tiger Reserve, Maharashtra
Principal Investigator(s)	:	Dr. K. Ramesh (PI), Dr. V. C. Ben (PI)
Researcher(s)	:	Shah Nawaz Jelil (Project Fellow), Avinash Arjun Gaykar (Project Fellow), Natasha Ajit Girkar (Project Fellow)
Funding Agency	:	Sahyadri Tiger Reserve Conservation Foundation
Project Duration	:	2016-2021

Dog is not a bird's best friend! Breeding distribution and proximate factors affecting nest success in four exclusively river-island nesting birds in the National Chambal Sanctuary, Uttar Pradesh

-Rohit R.S. Jha

Piscivorous, island-nesting birds are widely recognized to be ideal indicators of health of rivers and coastal landscapes. Four species of piscivorous birds, Indian Skimmer (*Rhynchops albicollis*), Black-bellied Tern (*Sterna acuticauda*), River Tern (*Sterna aurantia*), and Little Tern (*Sterna albifrons*) nest in the riverine islands of the National Chambal Sanctuary (NCS).

We assessed their breeding distribution and habitat factors affecting their reproductive success during April to June 2018 in the downstream area of the Chambal River within the NCS.

Information on river-islands with nesting birds was obtained from local researchers and forest watchers, and the nest fates of the four focal species on such islands within the study area (n=6 islands) were regularly monitored until either the chicks fledged, or all nesting activity ceased with the arrival of the monsoon. Habitat characteristics such as (index of) human disturbance, nesting initiation dates, river-island physical characteristics that were hypothesised to influence nesting success were measured in the field.

Overall, we found that nests initiated later in the breeding season had very low reproductive success mediated by the decreasing water depth around river-islands as the dry season progressed, which made commensal predators like dogs easily access them and depredate on eggs and hatchlings. Additional factors that lowered reproductive success included sand-mining, cattle movement and stochastic weather events like storms.

Our preliminary analyses reveal that nests initiated early in the season when the above-mentioned threats were lower in intensity, and presence of nest protectors positively affected reproductive success of all the four focal species, especially that of the Indian Skimmer.

Key words: Bird conservation, freshwater ecosystem, piscivorous birds, Canis familiaris, species-habitat association

Project Title	:	Diet, foraging behavior and habitat factors affecting breeding success of riverine island-nesting birds in the National Chambal Sanctuary
Principal Investigator(s)	:	Bivash Pandav, Gopi Sundar (Co-PI) (NCF), Swati Kittur (Co-PI) (NCF)
Researcher(s)	:	Rohit R.S. Jha (Project Fellow)
Funding Agency	:	WII Grant-in-aid
Project Duration	:	2017-2020

Living in the Anthropocene: Space-use and movement of Indian Grey Wolf

-Shaheer Khan and Sougata Sadhukhan

Indian grey wolf (*Canis lupus pallipes*) is the top predator of the open-plains of India and occupies large areas within human-dominated landscape. Schedule I species as per (Wildlife (Protection) Act, 1972), was once distributed across the country but is now restricted to small fragmented populations due to various anthropogenic factors. Inspite of having the same protection status as *Panthera tigris* in India, the species is not able to get attention from researchers and policy-makers due to its non-charismatic nature. To facilitate the conservation of this endangered canid, it is critical to gain insights about its basic ecology such as movement and space-use in the continuously changing landscape.

The study was conducted from December-2017 to August-2018 in semi-arid landscape of Maharashtra, exclusively in Pune and Solapur Districts. The landscape is dominated by crop-fields, grazing-land, scrublands, villages and territorial forest areas with human settlements.

Four wolves of three different packs were captured from Solapur (W1-Female and W2-Male), and Pune (W3-Female and W4-Male), using soft-catch leg-hold traps. They were immobilized using Ketamine-Xylazine and fitted with GPS-Plus Vectronics radio-collars with proximity sensor. Movement parameters of three individuals were calculated and their homerange was estimated using Brownian-Bridge Movement Model (BBMM).

The average displacement of W1 (717m/hr) and W2 (724m/hr) was found to be higher than W3 (555m/hr). Total displacement of W1 and W2 was found higher during night than daytime whereas, no difference was found in day-night movement of W3.

W1 was a dispersing female which dispersed from its natal area after two months from the date of collaring. The homerange of W1's pack after establishment of its territory was found 258km^2 (95% BBMM) with core area of 32km^2 (50% BBMM). The homerange of W2's pack was 400km^2, within which the pack had five clusters core areas of average size of 8km^2. The homerange of W3's pack was the smallest (59km^2) with core area of 6km^2.

The movement information generated from radio collaring is critical for devising long term conservation and management policies for species in human-dominated landscape.

Indian wolf, Semi-arid landscape, Maharashtra, Homerange

Project Title	:	Ecology of wolves with emphasis on dispersal in a human dominated landscape of Maharashtra, India
Principal Investigator(s)	:	Bilal Habib and Salvador Lyngdoh
Researcher(s)	:	Shaheer Khan (SRF) and Sougata Sadhukhan (JRF)
Funding Agency	:	Department of Science and Technology
Project Duration	:	3 years

Integrative taxonomic approach in delineating herpetofaunal species richness in Panna Tiger Reserve

-Vishal Kumar Prasad

Herpetofauna of Panna Tiger Reserve (PTR) in central India is not systematically documented so far. The aim of the study is to employ morphological, molecular and bioacoustics techniques to delineate cryptic herpetofaunal diversity of PTR.

We employed Nocturnal Visual Encounter Survey and opportunistic observations to determine inventory and relative abundance. Our acoustic analysis involved 8 parameters for 7 species using Raven pro1.4. Our morphometric study involved 12 characters of taxonomic importance. For identification of cryptic geckonid species, we used Cytochrome *b* (cyt *b*) and NADH dehydrogenase 2 (ND2) to infer the phylogeny.

We have recorded 50 species belonging to 19 families and 27 genera. The results of Principal Component Analysis of morphometric data of anurans reveals first two components shows 54.05% variation in the character out of which FLL,EL,TL,IMTL showed greater variation compared to others. Results of Principal Component Analysis using eight acoustic parameters of 7 frogs help us record cryptic lineage. Body mass distribution shows most species come under range of 10-15 (gms).The result of our molecular taxonomy revealed an undescribed gekkonid species of the genus Cyrtopdion (uncorrected p-distance10 %). The preliminary analysis with the Cyt *b* gene revealed 12 % variation from widely distributed *Cyrtopodion aravallense*.

Importance of such integrated approach in diversity studies are discussed. The study also reports records of globally threatened species from PTR. This study is significant in determining the true species richness and thus management of hitherto covert herpetofaunal assemblage in a Tiger Landscape.

Key words: Amphibian, Reptiles, Integrated taxonomy, Tiger Reserve, Diversity, Panna

Understanding dhole population parameters through non-invasive approaches in Eastern Vidarbha Landscape

-Shrushti Modi

Asiatic wild dog or dhole is a highly elusive, social, dense forest preferring canid with fragmented distribution in Southeast Asia. The remaining dhole populations face severe conservation challenges from anthropogenic interventions, but limited information is available at population and demography levels. Their cryptic nature, habitat preferences along with absence of individual-specific patterns make it difficult to generate population level information. In this study, we used non-invasively identified dhole individuals to understand preliminary population parameters of genetic differentiation and demography across four tiger reserves in Maharashtra, India.

This study was conducted in the Eastern Vidarbha landscape, Maharashtra covering four tiger reserves i.e. Tadoba-Andhari Tiger Reserve (TATR), Melghat Tiger Reserve (MTR), Pench Tiger Reserve (PTR) and Navegaon-Nagzira Tiger Reserve (NNTR).

We extensively surveyed the entire study area to collect 419 fresh canid faeces. Following DNA extraction in the laboratory we used a dhole-specific PCR assay for species identification. We standardized a panel of polymorphic microsatellite loci for DNA-based dhole individual identification. Unique dhole individuals from different parts of the study area were used to calculate summary statistics of genetic polymorphism and determine population structure and signatures of decline for these populations.

We ascertained 370 genetically confirmed dhole scats for individual identification from the study area. From an initial set of 37 cross-species markers we finalized a panel of 12 microsatellites for unambiguous individual identification. We generated data on 176 unique dhole individuals and identified 8 genetic recaptures from the total dhole scats collected. The populations were found to be under Hardy-Weinberg equilibrium and cumulative PID_{sibs} and $PID_{unbiased}$ values were 2×10^{-4} and 1.6×10^{-9}, respectively. The population structure analyses identified 3 clusters. Two independent demography analyses indicated varying signals of population decline in the populations.

Molecular approaches described here can be used to generate landscape level information on dholes, which can be critical in developing management plans and conservation measures for this endangered species.

Key words: Carnivores, non-invasive sampling, habitat fragmentation, gene flow, population structure

What's in a Name? Addressing an identity crisis of Himalayan Torrent Frogs

-Preeti Sharma

The aim of this species is to use concordant evidence from morphology and morphometry to investigate cryptic diversity in Dicroglossid frogs of the genus *Nanorana*.

The Study was conducted in Chamoli, Rudraprayag and Mussoorie districts of Uttarakhand that include Kedarnath and Benog Wildlife Sanctuaries.

We conducted nocturnal Visual Encounter Survey and opportunistic observations to collect presence only data. The morphometric data was obtained from field collection from Western Himalaya and museum specimens from Eastern Himalaya. We used Principal Component Analysis (PCA) using 12 morphological traits to delineate species complex within western Himalaya population and between western and eastern Himalayan species. Statistical analysis was performed using R studio and PAST software.

PCA detected patterns of morphological variation within populations of *Nanorana* spp of Himalayan region. The study revealed that *Nanorana vicina* (SVL range=106.94-55.24 ± 13.21) population represents two distinct species having significant difference in five morphological parameters; Snout Length, Head Length, Head width at nostril, Head width at angle of jaw and First Finger. A preliminary cladistic analysis using fourteen meristic traits also supported the taxonomic complexity in the genus.

Characterized by highly conserved morphology, identity of the Himalayan Paini Frog of the genus *Nanorana* remains a challenge across its distribution range. The finding of two new species in Western Himalayan region within one sampling season indicate diversity potential of the region. Recognition of cryptic species within *N. vicina* population demands a revisit to its global "least concerned" status assigned by IUCN.

Project Title	:	Spatial Ecology of Himalayan Torrent Frog Nanorana vicina in Uttarakhand
Principal Investigator(s)	:	Dr. Abhijit Das
Researcher(s)	:	Preeti Sharma (Junior Research Fellow)
Funding Agency	:	MoEFCC
Project Duration	:	3 Years

Validation of stress and reproductive hormone for non-invasive health monitoring of wild tigers

-Shiv Kumari Patel

Faecal hormone analysis has become an increasingly valuable method for studying physiology of free ranging animals. Species-specific variations in hormone metabolites excreted in faeces make it important to validate faecal assays across hormones. In this study, we validated stress and reproductive hormone assays from field-collected tiger faeces before large-scale field use.

The study area includes the Indian part of Terai-Arc Landscape (TAL) covering tiger habitats of Uttarakhand, Uttar Pradesh and Bihar.

We conducted intensive field surveys to collect fresh faecal samples from all tiger habitats in TAL. In the laboratory, we used DNA-based approaches to identify species, sex and unique tiger individuals from these samples. Some of these unique individuals were used to validate stress (Corticosterone) and reproductive (Progesterone and Testosterone) hormone assays. Selected frozen samples were lyophilized and sifted to get faecal powders, and hormone was extracted in 70% ethanol. Hormone quantification is done using ELISA (enzyme linked immunosorbent assay) technique. Validation of the assays were done by performing 'parallelism' and 'accuracy' tests.

We collected ~700 fresh tiger scats and genetically identified 234 unique individuals from the entire tiger habitats in TAL. Parallelism and accuracy assays of corticosterone, progesterone and testosterone hormones indicated reliable measurements of faecal hormone metabolites of these hormones across their ranges of concentration. Serial dilutions of faecal extracts paralleled respective standard curves for all three hormones and fifty percent binding occurred at 1:60 (corticosterone), 1:480 (progesterone) and 1:150 (Testosterone) dilutions. Hormone standards spiked with tiger faecal extracts produced slopes at 0.70 (corticosterone), 1.16 (progesterone), and 0.82 (testosterone), illustrating that faecal extracts did not interfere with their measurement precisions.

All validated assays accurately and reliably measured the respective hormone metabolites across different concentration ranges, without any interference from faecal products. These hormone assays can now be used to generate population-level stress profiles for tigers in TAL and monitor reproductive health of wild tigers in their natural habitats.

Key words: Terai-Arc Landscape, Endocrine profile, Glucocorticoids, Reproductive hormones, Physiological health monitoring.

Project Title	:	Understanding disturbance impacts on psychological, nutritional health and their effect on reproductive capacity of wild tiger and leopards in the Terai-Arc landscape
Principal Investigator(s)	:	Dr. Samrat Mondol, Dr.Bivash Pandav
Researcher(s)	:	Shiv Kumari Patel
Funding Agency	:	Grant-in-Aid WII
Project Duration	:	3 years

Assessing the Impacts of Powerlines on Avian species in the Arid Plains of western Gujarat

-Vipin Rao

Gujarat has recorded significant economic growth over the past decade and continued industrialization and urbanization has led to greater demand for power. To meet this demand, its energy sector has undergone significant growth in the past few years, which has resulted in setting up of extensive network of power lines and windmills posing significant threat to birds either through collision or electrocution. Therefore, the aim of this study is to attempt first systematic study covering the entire Kachchh district in order to understand the impacts of powerlines and windmills particularly on large avian species in the region. The arid plains of Kachchh district is unique in that it supports the largest breeding colony of Flamingos and is also an important wintering ground for Cranes and other migratory waterbirds as well as raptors.

We divided entire Kutch district into 20X20 km grids and prioritized these as high, moderate and low based on length, number and kV capacity (for powerlines) and only numbers (for windmills). Further, the Land Use Land Cover map of the entire landscape was generated to be used as an important variable in distribution modeling of the focal species. Rapid questionnaire and field survey was conducted between May-August, 2018 and data was collected regarding presence of focal bird species and mortality along the powerlines. Additionally, seventy pylons of 32 different powerlines have been surveyed to characterize its configuration and assess the risk zones at certain height for birds.

During the primary surveys, a total of 11 carcasses, including 5 flamingoes, were recorded at eight locations beneath powerlines.

In future, fine scale data of presence/absence of focal bird species and their habitat usage will be collected. Also, twenty birds will be fitted with telemetry devices to understand their local movements.

Using this data along with distribution models overlaid on powerline and windmill network, vulnerable areas across the landscape will be identified so as to come up with suitable mitigation measures for bird safety.

Project Title	:	Assessing the impacts of Power lines on Avifauna species in the arid plains of Western Gujarat
Principal Investigator(s)	:	Dr. R Suresh Kumar and Dr. Anju Baroth
Researcher(s)	:	Vipin Rao (Project Associate)
Funding Agency	:	Power Grid Corporation of India Ltd.
Project Duration	:	2 years

Undefined boundaries, prickly neighbors: Preliminary insights on human–elephant interactions in Chhattisgarh

-N. Lakshminarayanan and Ankit Kumar

Elephants have recolonized Chhattisgarh during late 1980s from the neighboring states of Jharkhand and Odisha after being absent for six to seven decades. The period of re-colonization has been turbulent with acute conflict between people and elephants resulting in loss of many lives. It is in this context that we initiated our long-term study, which is multidisciplinary and comprises of many objectives. Our overarching objective is to understand the nature of human–elephant interactions and suggest strategies to ameliorate conflict. The objectives specific to this presentation are to describe the land-use, and spatial extent of human–elephant interaction in the landscape and to show how elephants use different elements of this mosaic landscape and its ramifications on human–elephant interactions.

Our study was carried out in Surguja and Bilaspur Forest Circles in Chhattisgarh comprising of eight Forest Divisions. The landscape is a mosaic of natural forests interspersed with human use areas.

We followed elephants and created a repository of photos to identify unique individuals using morphological features. We used "re-sighting data" to understand how elephants use the mosaic landscape. During the months of May and June, we have collared two elephants – a bull and a cow – with satellite collars and followed them. Home range of collared elephants was estimated using MCP (minimum convex polygon) estimator. We collated over 24500 crop damage records for the period from 2015 to 2017 and created a heat map to show the spatial spread of crop damage by elephants using Kernel Density Estimator in GIS.

Crop damage records show that over 520 villages suffered crop damage by elephants during the three year period in Surguja circle. Although there were conflict hotspots, the spatial extent of crop damage by elephants was widespread, spanning over 15000 km2. It transpires that elephants range very widely and have sauntered several villages across five forest divisions for a short duration of time. Home range estimate of an identified elephant group, calculated based on re-sighting data, spanned ca~1000 km2. Furthermore, an identified elephant group exhibited "streaking behavior", which is akin to exploratory behavior, traversing new areas. The collared bull, an adult makhna, used an area close to 350 km2 in three months based on MCP estimates and caused heightened conflict by damaging crops frequently and breaking houses. The bull included human use areas in to its range. In comparison the collared cow had a small home range of just 20 km2 during the two month period and was largely confined to forests. Drawing insights from our results we discuss a few management strategies to address conflict.

Key words: Home range, photographic re-sighting, crop damage, streaking behavior

Project Title	:	Conservation management of elephants in Chhattisgarh: A capacity building initiative
Principal Investigator(s)	:	Dr. Bivash Pandav, Dr. Parag Nigam and Dr. Ajay Desai (External Consultant)
Researcher(s)	:	N. Lakshminarayanan (Project Associate) and Ankit Kumar (Research Fellow)
Funding Agency	:	Chhattisgarh Forest Department
Project Duration	:	2017-2019