भारतीय वन्यजीव संस्थान
Wildlife Institute of India

13th INTERNAL ANNUAL RESEARCH SEMINAR

August 30, 2017

Programme & Abstracts

भारतीय वन्यजीव संस्थान
Wildlife Institute of India

XIII INTERNAL ANNUAL RESEARCH SEMINAR

Wednesday, 30th August 2017

PROGRAMME

Seminar Chairperson: Shri Vinod Rishi, Former ADG(WL), MoEFCC

INAUGURAL SESSION

0915 – 0920 h Welcome

Dr. Bitapi Sinha**,** Research Coordinator, WII

0920 – 0930 h Opening Remarks

Dr. G.S. Rawat, *Dean,* WII

TECHNICAL SESSION – I

NATIONAL MISSION ON CLEAN GANGA

Chair : Dr. Ruchi Badola, Scientist-G

Co-Chair(s) : 1. Dr. J. A. Johnson, Scientist-E

2. Dr. Anju Baroth, Scientist-C

0930-0945 Ganga Aqualife Conservation Monitoring Centre

Dr. Niladri Dasgupta, Project Scientist

0945-1000 Planning Aquatic Species Restoration for Ganga River

Goura Chandra Das, Project Associate

1000-1015 Capacity Building of Forest Department and other stakeholders

Dr. Sangeeta Angom, Project Associate

1015-1030 Establishment of Rescue and Rehabilitation Centres

Aftab Usmani, Project Associate

1030-1045 Community based conservation programmes for species restoration in Ganga River

Dr. Pariva Dobriyal, Project Scientist

1045-1100 Conservation education- A tool for eliciting public support for conservation of Ganga

Dimpi Patel, Project Fellow

1100-1120 Discussion & Remarks by Chair and Co-Chairs

1120-1135 Tea

TECHNICAL SESSION – II

CONSERVATION BIOLOGY

Chair : Dr. Asha Rajvanshi, Scientist-G

Co-Chair(s) : 1. Dr. Parag Nigam, Scientist-E

2. C. Ramesh, Scientist-C

1135-1150 Wandering giants, indigent people: A multi-pronged approach to manage human–elephant conflict in Chhattisgarh

Dr. Bivash Pandav, Scientist-F ***/ Ankit Kumar,*** Project Fellow

1150-1205 Conservation physiology: A new approach to understand disturbance impacts in endangered large feline carnivores

Shiv Kumari Patel, Junior Research Fellow

1205-1220 Ecological Impact Assessment of existing and proposed road and rail infrastructure on wildlife corridors in Central Indian Landscape

Adrian W lyngdoh, Junior Research Fellow

& Akanksha Saxena, Senior Research Fellow

1220-1235 Breaking barriers: assessment of physical barriers for wild pigs and additionally some insights on patterns and perceptions of human – wild pig conflict

Ankit Kumar, Project Fellow

1235-1250 Discussion & Remarks by Chair and Co-Chairs

TECHNICAL SESSION – III

SPECIES RECOVERY, STATUS SURVEY & MONITORING

Chair : Shri Qamar Qureshi, Scientist-G

Co-Chair(s) : 1. Dr. K. Sivakumar, Scientist-F

2. Dr. Gopi, G.V., Scientist-E

1250-1305 Conservation of Gangetic Dolphins in Brahmaputra river system, Assam in 2016-17

Dr. Abdul Wakid, Project Scientist

1305-1320 River Dolphin oil-bait fishery in lower Assam - A preliminary assessment

Leela Prasad, Project Fellow

1320-1335 Multi-sectoral use of river water and ganges river dolphin conservation: issues engagement with key stakeholders and the way forward

Dr. Rashid Raza, Project Scientist

1335-1430 Lunch

1430-1445 Population trend of Gharial (*Gavialis gangeticus*) in the National Chambal Sanctuary

Suyash Praful Katdare, Senior Research Fellow

1445-1500 Tigers and their prey in Dibang Valley District, Arunachal Pradesh: An update

Aisho Adhikarimayum, Senior Research Fellow

1500-1515 Predicting swamp deer distribution in the upper Gangetic plains using a combination of survey and molecular approaches

Shrutarshi Paul, Junior Research Fellow

1515-1535 Discussion & Remarks by Chair and Co-Chairs

1535-1550 Tea

TECHNICAL SESSION – IV

SPECIES-HABITAT RELATIONSHIPS

Chair : Dr. Pratap Singh, Scientist-G

Co-Chair(s) : 1. Dr. V.P. Uniyal, Scientist-F

2. Dr. K. Ramesh, Scientist-E

1550-1605 Preliminary findings of seasonal and habitat influence on bird species richness and distribution pattern in Sahyadri Tiger Reserve

Surabhi Sati, Project Biologist

1605-1620	Amphibians of Panna Tiger Reserve: Diversity, ecology and population monitoring ***Vishal Prasad***, Project Fellow
1620-1635	Carnivores of the light and darkness: activity pattern, habitat use and niche segregation in a tropical semi-evergreen forest, Assam ***Urjit Bhatt,*** Junior Research Fellow
1635-1645	**Discussion & Remarks by Chair and Co-Chairs**

TECHNICAL SESSION – V

CONSERVATION GENETICS

Chair : Dr. Y.V. Jhala, Scientist-G

Co-Chair(s) : 1. Dr. Sandeep Gupta, Scientist-E

2. Dr. Samrat Mondol, Scientist-D

1645-1700	Developing genetic database to understand meta population dynamics and connectivity of tigers and other large carnivores across tiger landscape of Maharashtra, India: Preliminary insights ***Shrushti Modi***, Junior Research Fellow
1700-1715	Genetic characterization of whale shark (*Rhincodon typus*, Smith, 1828) around Gujarat coast, India ***Bheem Dutt Joshi,*** Research Associate
1715-1730	Molecular data revels genetic sub-populations of tiger in the Terai-Arc landscape, India ***Suwankar Biswas,*** Junior Research Fellow
1730-1745	Insight into RhODIS ***Tista Ghosh,*** Junior Research Fellow
1745-1800	**Discussion & Remarks by Chair and Co-Chairs**
1800-1815	**Concluding Remarks by the Seminar Chairperson**
1815-1830	**Vote of Thanks** ***Dr. Bitapi Sinha*****,** Scientist-G

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Ganga Aqualife Conservation Monitoring Centre

-Dr. Niladri Dasgupta

Aim: The project aims to promote, design and implement science based restoration of aquatic wildlife through Ganga Aqualife Conservation Monitoring Centre (GACMC) in the Ganga River Basin by propagating knowledge and involving relevant stakeholders in species restoration planning under Namami Gange program of National Mission for Clean Ganga (NMCG), Ministry of Water Resources, River Development and Ganga Rejuvenation.

Location: The GACMC is established at Wildlife Institute of India (WII), Dehradun, and the project is being implemented in the five Ganga River States *viz*. Uttarakhand, Uttar Pradesh, Bihar, Jharkhand and West Bengal.

Methods: Systematic conservation processes has been initiated through extensive review of literature, rapid biodiversity assessment of Ganga River, stakeholder consultation and database management.

Results: WII as a lead knowledge partner and conservation planning body of NMCG established the GACMC, capitalizing on its existing facilities for spatial analysis, ecotoxicological research, conservation genetics as well as field assessment of aquatic biodiversity. Based on literature review, status of aquatic biodiversity of Ganga River was assessed. The review suggests that the distribution and abundance of aquatic fauna has been affected by the dispersal barriers, reduced flow and loss of connectivity between habitats. The rapid biodiversity assessment carried out during summer in a 2025 km stretch of the Ganga River between Devprayag to Farakka indicated that despite mounting anthropogenic pressure, the Ganga River retains significant ecological value in terms of species richness. GACMC is disseminating knowledge through print and digital media about significance of Ganga River, its biodiversity and the issues related to biodiversity loss by publishing awareness materials under the 'Vibrant Ganga' Series and a webpage dedicated to the project activities. More than 575 people are following the web-based informative pages of the project. First phase of stakeholder consultation has been initiated to bring all on a common platform for conservation and restoration of biodiversity of Ganga River. A database management framework for spatial and non-spatial data collected from various surveys and secondary literature has been established through PostgreSQL software. The progress of the works of GACMC is regularly monitored through audit as well as scrutinizing visits from NMCG officials.

Keywords: Aqautic fauna, Assessment, Restoration, Stakeholder, Database

Project Title	:	Biodiversity Conservation and Ganga Rejuvenation
Principal Investigator(s)	:	Dr. S.A. Hussain, Dr. Ruchi Badola and Dr. Gautam Talukdar
Researcher(s)	:	Dr. Niladri Dasgupta (Project Scientist), Dr. Shivani Barthwal (Project Associate), Michelle Irengbam, Anita Devi, Aishwarya R. Chandran, Ravindra Nath Tripathi, (Project Fellows),Shatakshi Sharma and Debanjan Sarkar (Project Assistants)
Funding Agency	:	National Mission for Clean Ganga (NMCG), Ministry of Water Resources, River Development and Ganga Rejuvenation, Government of India
Project Duration	:	2016 - 2019

Planning Aquatic Species Restoration for Ganga River

-Goura Chandra Das

Aim: To assess the status of aquatic biodiversity and document ecological requirement of critically endangered species for preparing a restoration plan.

Location: The study was carried out in selected representative sites from upper reaches of Ganga River to river mouth at Ganga Sagar.

Methods: A literature review was carried out on the physico-chemical and ecological aspects of Ganga River. Followed by review, a reconnaissance field survey was conducted between upper reaches of Ganga River to Farakka. A vessel-based visual count method was adopted to enumerate the distribution of dolphins (*Platanista gangetica*), gharials (*Gavialis gangeticus*), mugger (*Crocodylus palustris*) and turtles in the Ganga River. Data on presence and distribution of otters, birds, herpetofauna, fishes and invertebrates were collected following specific protocols available for each taxon. Further, tissue samples were collected for population genetic study and water as well as tissue samples were collected for toxicological studies.

Results: The maximum publications reviewed on water quality (24.23%) followed by fish diversity (22.03%), invertebrates (11.01%), ecology of Ganga River (10.13%) and dolphin (8.81%). Limited publications were available on otters and amphibians (1.32%) indicating less studies from Ganga River. During the reconnaissance survey, the distribution of Golden Mahseer was observed between Maneri to Rishikesh. Distribution of dolphin was observed between Garhmukteshwar to Narora, Fathehpur to Mirzapur and downstream of Varanasi till Farakka with an encounter rate of 0.32 (individuals/km) followed by Indian Skimmer (0.24), black bellied tern (0.11) and gharial with an encounter rate of 0.01. Only one sighting each of Smooth-coated Otter (*Lutrogale perspicillata*) and mugger were reported from the study stretch. In total, 106 species of birds, 13 species of reptiles (2 species of crocodiles, 6 species of turtles, 3 species of snakes and 2 species of lizards), 9 species of amphibians, 92 species of fish, 44 species of arthropods (including 22 species of butterflies) and 5 species of molluscs have been recorded during the survey.

Conclusion: Based on the reconnaissance survey, topographic features, ecological condition as well as available literature the entire Ganga River was divided into six sections and the intensive sampling locations has been prepared for biodiversity profiling and future monitoring.

Keywords: WII-NMCG, biodiversity, ecological assessment, toxicology, conservation

Project Title	:	WII-NMCG 'Biodiversity Conservation and Ganga Rejuvenation'
Principal Investigator(s)	:	Dr. J.A. Johnson (Coordinator), Dr. S.A. Hussain (Co-Coordinator), Dr V.P. Uniyal, Dr. B.S. Adhikari , Dr. Gopi, G.V., Dr. S.K. Gupta, Dr. G. Talukdar, Dr. S. Kumar and Dr. A. Baroth
Researcher(s)	:	Arvind Kumar Dwivedi, Ajit Kumar Awasthi, Zeeshan Ali, Richika Sah, Goura Chandra Das (Project Associates), Kritish De, Chetan Ahada, Prabhakar Yadav, Bitupan Bourah, Anuja Mittal (Project Fellows), Ajay Rawat, Megha Shruti (Project Assistants)
Funding Agency	:	National Mission for Clean Ganga (NMCG), Ministry of Water Resources, River Development and Ganga Rejuvenation, Govt. of India
Project Duration	:	2016 - 2019

Capacity Building of Forest Department and other Stakeholders

-Dr. Sangeeta Angom

Aim: Biodiversity rejuvenation of Ganga River calls for nationwide action by policy-makers, protected area managers, frontline staff of forest departments, research organizations, local communities, NGOs, industries and other line agencies. Success of the efforts to restore the Ganga River would depend on the involvement of skilled manpower and by disseminating knowledge and conducting training in various field methodologies. The major objective is to identify and create spearhead teams consisting of forest staff, local youth and train them in different aspects of participatory management and methodologies for survey of indicator species. To develop the capacity of forest officers and other stakeholders of Ganga States for monitoring of aquatic wildlife of conservation concern, management planning of wetlands, community involvement in conservation and conservation education.

Location: The project is being implemented in the five Ganga river States viz. Uttarakhand, Uttar Pradesh, Bihar, Jharkhand and West Bengal.

Methods: The training curriculum was developed after intensive literature review. Communications were done with the forest departments and other stakeholders of five Ganga river states. Training workshops and awareness programmes were designed and delivered according to the constitution of the target groups.

Results: Spearhead teams have been established for the states of Uttar Pradesh, West Bengal, Bihar and Jharkhand. Twenty-five members of NMCG-WII team underwent orientation and capacity building under 'training of trainers' program on restoration and conservation of biodiversity of Ganga River. A total of 74 forest officials and representatives from line agencies were imparted training on wetland management and ecological monitoring techniques of aquatic species of Ganga River. A total of 268 stakeholders comprising of veterinarians, members of Panchayati Raj Institutions, women scientists and local communities were given training on participatory management. A total of 174 students from colleges and universities were trained on river ecology, biodiversity monitoring and wetland ecosystems and they are now deployed at field stations to assist the project team. A total of 480 school children were sensitized on different aspects of biodiversity conservation and conservation education.

Conclusion: For the past one year, we have rallied for Ganga rejuvenation and have trained and sensitized 1021 participants from different target groups to create a Steward Network.

Keywords: Participatory management; Ecological monitoring; Ganga river basin; Spearhead team; Biodiversity conservation

Project Title	:	Biodiversity Conservation and Ganga Rejuvenation
Principal Investigator(s)	:	Dr. Ruchi Badola
Researcher(s)	:	Dr. Sangeeta Angom (Project Associate & Training Coordinator), Ms. Monika Sharma (Project Fellow)
Funding Agency	:	National Mission for Clean Ganga (NMCG)
Project Duration	:	2016 - 2019

Establishment of Rescue and Rehabilitation Centres

-Aftab A. Usmani

Aim: The project aims to assist NMCG in establishing rescue and rehabilitation centres for aquatic fauna of the Ganga River at select sites by developing human resources and infrastructure with support from the Forest and Veterinary departments.

Location: Narora Turtle Rescue Centre managed by Narora Atomic Power Station and *Kachhua Punarvas Kendra* at Sarnath managed by Uttar Pradesh Forest Department.

Methodology: Protocols for transportation, handling, feeding, quarantine and release are being developed for rescue, rehabilitation and husbandry of aquatic higher vertebrate fauna.

Results: To develop standard models for "confiscation-veterinary care-husbandry-release/rehabilitation" operations, two existing facilities were adopted by WII: Turtle Rescue Center managed by Narora Atomic Power Station and Sarnath *Kachhua Punarvas Kendra* managed by Uttar Pradesh Forest Department. Existing husbandry ponds at both the centers were upgraded. For the Capacity enhancement of forest department, field veterinarians and other stakeholders in managing emergent situations, 'capacity enhancement and training workshops' were organized at Bulandshahar and Sarnath. Rescue and rehabilitation operations were carried out in collaboration with Uttar Pradesh Forest Department in Parallel Lower Ganga Canal to rescue the confined aquatic fauna during the concretization of the canal. A total 158 of individuals of turtles belonging to nine species and one juvenile mugger (*Crocodylus palustris*) were rescued and released upstream of Narora barrage. At Sarnath Center the State Forest Department brought 2,478 rescued turtles, where they were rehabilitated and later released in Turtle Sanctuary at Varanasi. During the *Ganga Nirikshan Yatra*, Shushri Uma Bharti, Hon'able Minister of Water Resources, River Development & Ganga Rejuvenation, visited the Rescue and Rehabilitation Center at Narora and highly appreciated the functions and operations of the Center. She suggested creation of more such centers.

Keywords: Aquatic fauna, Confiscation, Veterinary, Husbandry, Training

Project Title	:	Biodiversity Conservation and Ganga Rejuvenation
Principal Investigator(s)	:	Dr. Suresh Kumar, Dr. Abhijit Das, Dr. S. A. Hussain, Dr. S. K. Gupta and Dr. Ramesh C.
Researcher(s)	:	Aftab A. Usmani (Project Associate), Dr. Animesh Talukdar, Narendra Mohan (Project Fellows)
Funding Agency	:	National Mission for Clean Ganga, Ministry of Water Resources, River Development and Ganga Rejuvenation, Government of India
Project Duration	:	2016 - 2019

Community Based Conservation Programmes for Species Restoration in Ganga River

-Pariva Dobriyal

Aim: The programme focuses on development of strategies to involve the stakeholders in conservation by (a) involving local communities in conservation through the Panchayati Raj System, (b) eliciting the participation of stakeholders at different levels to achieve the biodiversity conservation goal (c) assessing the monetary contribution of ecosystem services provided by Ganga River to different stakeholders, (d) developing site-specific strategies for aligning local people's livelihoods with conservation priorities, (e) developing institutional mechanisms for the sustainability of project initiatives at the demonstration sites.

Location: The project is being implemented in five Ganga river states with primary focus on Uttar Pradesh.

Methods: Different stakeholders were identified at various levels using snowball technique. Villagers were approached through village *panchayats.* Focus group discussions (n=35) and questionnaire-based household surveys were conducted to understand their socioeconomic status, aspirations and perception towards Ganga and ways and means to involve them in Ganga aqualife conservation.

Results: A total of 4454 participants representing various stakeholder groups including local communities were sensitized during 230 meetings and workshops conducted at various sites in Uttarakhand and Uttar Pradesh. Riverside communities were sensitized through the padyatras, wall paintings and slogans at the areas of interest. Formal agreements have been signed with 49 gram panchayats pledging support for Ganga aqualife conservation. Formal agreement have been signed with Rural Self Employment Training Institute of Punjab National Bank for capacity development and funding support for alternate livelihood opportunities. A trained cadre of 44 Ganga Praharis has been mobilized at Uttarakhand and Uttar Pradesh for networking and monitoring of the aqualife of Ganga River. Links have been established with several government and non-government organizations such as Nehru Yuva Centre and National Rural Livelihood Mission, DST-SEED programme and agreement for formalization of the linkages are in various stages.

Keywords: Stakeholders; community participation; Panchayati Raj system; livelihood interventions; ecosystem services

Project Title	:	Biodiversity Conservation and Ganga Rejuvenation
Principal Investigator(s)	:	Dr. Ruchi Badola, Dr. S.A. Hussain, Dr. Anju Baroth and Ajay Srivastava
Researcher(s)	:	Pariva Dobriyal (Project Scientist), Deepika Dogra, Vipul Maurya (Project Associates), Aditi Dev, Amanat Kaur Gill and Ekta Sharma (Project Fellows)
Funding Agency	:	National Mission for Clean Ganga, Ministry of Water Resources, River Development and Ganga Rejuvenation
Project Duration	:	2016 - 2019

Conservation Education- A Tool for Eliciting Public Support for Conservation of Ganga

-Dimpi Patel

Introduction: Human population around the Ganga river basin is dependent on the river for large number of economic and religious activities. Low income, poor sanitation and low education levels of this community are some of the factors that affect the aquatic biodiversity of the basin. River Ganga has been facing conservation challenges which need to be addressed with the support of the communities living on its bank thus conservation education, awareness and training among people are required.

Study Area: Ganga flows through five states of India and for now two sites Narora and Varanasi in Uttar Pradesh have been identified for the establishment of Knowledge Centers. Awareness programs would be planned in different places all along the stretch of the river.

Objectives: The main objectives of the component are:

1. Outreach programs about the value of aquatic biodiversity and natural processes through the establishment of Interpretation Centre.
2. Educating and involving the local public by creating environmental education programs.

The scientific information gathered, from 5 other components of NMCG and through literature review, is being compiled and translated into simple- easy to understand language. In order to make the information attractive, relevant line drawings and paintings are prepared. These are then being weaved into unattended services like posters, leaflets, factsheets, wall paintings, signages and exhibits for wide circulation and distribution. We plan to develop floating exhibition on '*Bajra*' for which ground work is being done. Questionnaire survey for visitors, hotels and educational institutions on the acceptability of the idea of a floating exhibition is underway.

By making these efforts, we are trying to involve public especially youth so that they understand the sole purpose of conservation and sustainable use of resources.

Keywords: outreach, capacity building, interpretation, community, awareness

Project Title	:	Biodiversity Conservation and Ganga Rejuvination
Principal Investigator(s)	:	Dr. Bitapi C. Sinha
Researcher(s)	:	Dimpi Patel (Project Fellow)
Funding Agency	:	National Mission on Clean Ganga, Govt. of India
Project Duration	:	2017-2019

Wandering Giants, Indigent People: A Multi-Pronged Approach to Manage Human–Elephant Conflict in Chhattisgarh

-Dr. Bivash Pandav and Ankit Kumar

Aim: Elephants have re-colonized Chhattisgarh few decades ago due to mining and other associated threats in their 'original' range in Jharkhand and Odisha. The forests in Chhattisgarh where elephants have been displaced are highly fragmented and suffer different levels of degradation. Moreover, the local people and FD management are unacquainted of managing elephants and therefore, the re-colonization period continues to be turbulent with over 30 human deaths every year. It is in this backdrop that our study has begun during July 2017. This three-year study envisages investigating the patterns and drivers of human–elephant conflict in Chhattisgarh through a multi-pronged approach.

The overarching, long-term objective is to identify suitable habitats and improve them so that elephants 'settle down' and conflict levels go down substantially. Additionally, we endeavor to inculcate best practices in elephant management to different levels of Forest Department through on-field and off-field curriculum-based training sessions.

Location: Surguja, Surajpur, Balrampur, Jashpur, Daramjaigarh, Korba, Khatgora, Raigarh FDs

Methods: *Field:* Field methods include individual identification of elephants through morphological features. A total of 12 elephants would be collared (satellite) to understand home range, social and spatial organization. Age-sex classification is being done both in field and from stock photos. Further, conflict (crop & property damage, human & elephant deaths) mapping is being done at 1 km^2 resolution.

Analytical: Home range will be estimated using Kernel Density Estimates. Resistance models would be used to delineate corridors. Population models would be used to assess vital rates and GLM approach would be used to assess drivers of conflict.

Work done so far:

1. Reconnaissance surveys: 5000 km of drive and 100 km of walk effort
2. Age-classification of two different groups of elephants
3. Identification of individual elephants for collaring
4. Secondary data from FD records on crop & property damage

Keywords: Home range, demography, staff training

Project Title	:	Conservation management of elephants in Chhatisgarh: capacity building initiative on the dispersal and ranging pattern of elephants for effective management of human - elephant conflict
Principal Investigator(s)	:	Dr. Bivash Pandav
Researcher(s)	:	N. Lakshminarayanan (Project Associate), Ankit Kumar (Project Fellow)
Funding Agency	:	Chhatisgarh Forest Department
Project Duration	:	2017 - 2020

Conservation Physiology: A New Approach to Understand Disturbance Impacts in Endangered Large Feline Carnivores

-Shiv Kumari Patel

Aim: This study aims to understand various ecological disturbance impacts on psychological, nutritional health & their effect on reproductive capacity of wild Tigers and Leopards in the Terai-Arc Landscape.

Study Area: The study area covers the entire Terai-Arc Landscape (India) including the states of Uttarakhand, Uttar Pradesh and Bihar.

Method: Faecal samples of Tigers and Leopards have been collected intensively from the entire Terai-Arc landscape. For each sample, the GPS coordinate of its location along with other supplementary information (e.g. scrape marks, tracks etc.) is known and species, sex and individual level identification is already ascertained through DNA. The samples are stored in freezer and will be thawed, thoroughly mixed, freeze dried, sifted, remixed and then extracted in 90% ethanol for glucocorticoid (GCs), Triiodithyronine (T3), progesterone and testosterone hormones using protocols recently validated for tigers. We aim to develop location-specific resource selection probability functions (RSPF) for both tigers and leopards by fitting scat locations to a variety of habitat-based covariates, including those associated with human disturbance and presence of livestock. Further we will use generalized linear models to assess how physiological impacts of nutritional and psychological stress in wild tiger and leopard populations vary with the above RSPF measures, as well as with their sex, seasons and habitat protection status in the Terai-Arc landscape.

Expected Outcomes: The study would provide first quantitative measures of psychological/nutritional stress, reproductive status, breeding capacities of Tiger and Leopard population related to various levels of environmental disturbances in the Terai-Arc landscape. The physiological baselines that we will generate will be valuable for guiding reintroduction efforts and monitoring their success over extended time scales and habitats. Results will improve our understanding of links between habitat preferences and physiological stress, and how this is impacted by exposure and associated human wildlife interactions. This should lead to species-specific mitigation strategies to promote tiger and leopard conservation throughout the landscape.

Keywords: Terai-Arc Landscape, Tiger, Leopard, Glucocorticoid (GCs), Triidothyronine (T3), Progesterone, Testosterone, RSPF.

Project Title	:	To understand various ecological disturbance impacts on psychological, nutritional health & their effect on reproductive capacity of wild Tigers and Leopards in the Terai-Arc Landscape.
Principal Investigator(s)	:	Dr. Samrat Mondol (Principal Investigator), Dr. Bivash Pandav. (Co-investigator)
Researcher(s)	:	Shiv Kumari Patel (Junior Research Fellow)
Funding Agency	:	Grant-in-Aid WII funded project
Project Duration	:	2017 – 2020

Ecological Impact Assessment of Existing and Proposed Roads and Railways on Wildlife Corridors in Central Indian Landscape

-Adrian Lyngdoh and Akanksha Saxena

Aim: Profiling infrastructure-induced vulnerability of wildlife corridors in Central Indian Landscape. Assessing responses of mammals to road-related impacts.

Study area: NH 7 along Pench Tiger Reserve, Madhya Pradesh and Maharashtra.

Methodology: Wildlife corridors are integral for maintaining connectivity of habitats within the landscape. Using GIS-based multicriteria-spatial decision support system, vulnerability of these corridors to road/rail-induced fragmentation was assessed.

Response of animals to linear infrastructure is well-established and varies with species. To assess responses to road-related disturbance, pellet plots of 10 m radius were laid at every 250 m interval along 2 km long transects along 57 km stretch of NH7 intersecting the Pench-Kanha corridor. Pellet group counts, vegetation characteristics and disturbance variables were recorded. The data was analyzed using non-linear regression and exponential association. To determine spatial and temporal patterns of various species, camera traps were deployed in 500x500 m grids spread over 24 km^2 area on both sides of the road. Patterns on space use were analyzed using camtrapR, overlap and unmark packages in RStudio.

Results: Pench-Satpura-Melghat, Pench-Kanha, Kanha-Nawegaon-Indrabati and Kanha-Achanakamar were identified as the most important corridors for maintaining landscape connectivity. Most fragmented corridors are Pench-Satpura-Melghat, Nawegaon-Tadoba, Tadoba-Indrabati and Nawegaon-Indrabati. Pench-Satpura-Melghat, Nawegaon-Indrabati, Kanha-Nawegaon and Kanha-Pench corridors are most vulnerable to fragmentation, by linear developments at multiple locations.

Habitat use analysis through pellet data reveals that use of roadside habitat by chital is similar to that away from the road, whereas for sambar and wild pig it increases with increasing distance from road. Similar patterns are observed in spatial use of habitat by the three species, while temporal segregation with high traffic periods was observed in gaur and sambar near roadside habitats.

Conclusion: Our analysis shows that those corridors which are integral for connectivity are also the most vulnerable to fragmentation.

Preliminary results of mammalian responses to road-related disturbance reflect that there may be different levels of tolerance and habituation of disturbance among different species.

Keywords: Vulnerability assessment, fragmentation, connectivity, habitat use, road ecology

Project Title	:	Ecological impact assessment of existing and proposed road infrastructure in important wildlife corridors in India for strategic planning of smart green infrastructure
Principal Investigator(s)	:	Dr. Asha Rajvanshi (Principal Investigator), Dr Bilal Habib (Co-Investigator)
Researcher(s)	:	Akanksha Saxena (Senior Research Fellow), Adrian Lyngdoh (Junior Research Fellow)
Funding Agency	:	National Tiger Conservation Authority
Project Duration	:	3 years

Breaking Barriers: Assessment of Physical Barriers for Wild Pigs and Additionally some Insights on Patterns and Perceptions of Human – Wild Pig Conflict

-Ankit Kumar

Aim: Wild pig conflict is omnipresent and lately, there is lot of political interest in the problem. In Uttarakhand, to manage wild pig conflict, the Forest Department has built walls and other physical barriers. Since physical barriers are expensive to establish and maintain assessing their efficacy is imperative. Recognizing this, UKFD solicited scientific evaluation of barriers for wild pigs.

We assess efficacy of walls and other barriers used in the hill region of Garhwal and Kumaon for wild pig conflict mitigation. We also assess the factors that could influence efficacy and suggest improvement measures. Since, wild pigs are one of the most widely distributed species, planning for physical barriers needs to be prioritized based on objective assessment of conflict. Thus, we objectively monitor conflict by quantifying crop damage by wild pigs in one settlement and discuss results. Further, we also compared the actual damage with perceived damage reported by people

Location: Upper Yamuna, Almora, Pithoragarh, Bageshwar and Haridwar forest divisions in Uttarakhand

Methods: *Field:* Barrier assessment was done through mapping, measurement of dimensions, breaches and animal incursion at every 50m span. Additionally, interview surveys with beneficiaries were carried out to assess overall efficacy. Quantification of conflict involved measurement of crop damage using 1m2 quadrats

Analytical: Non-parametric Kruskal Wallis test was used to compare efficacy between various barrier types

T-test was used to compare actual and perceived crop damage

Logistic regression (binomial family) was used to examine the effect of variables on prob. of crop damage by pigs

Results: Efficacy of physical barriers for pigs was influenced by span, placement, workmanship, maintenance and local people's participation. Local people perceived wild pigs as the most problematic species. There is significant difference between actual crop damage and perceived damage. Distance to forest is the best predictor of crop damage by pigs.

Keywords: Physical barrier, actual conflict, perceived conflict.

Project Title	:	Evaluation of wall and other barrier used for stop crop depredation by wild pig and elephants in Uttarakhand
Principal Investigator(s)	:	Dr. Bivash Pandav and Ajay Desai
Researcher(s)	:	N. Lakshminaryanan (Senior Research Biologist), Ankit Kumar (Research Biologist)
Funding Agency	:	Uttarakhand Forest Department
Project Duration	:	2017-2018

Conservation of Gangetic Dolphin in Brahmaputra River System in 2016-17

-Dr. Abdul Wakid

Aim: Ganges River Dolphin is an Endangered Species of River Dolphin and there are about 600-700 individual dolphins in Brahmaputra river system within Assam. This project aims to (a) estimate abundance, distribution, ecology and threats of dolphins, and (b) undertake conservation activities in association with concerned stakeholders in Assam.

Location: Brahmaputra river system within Assam.

Methods: Independent double observer based capture-recapture method and direct sighting method were followed for dolphin survey in Kulsi and Subansiri River. YSI handhold multiparameter instrument was used for water quality sampling. Plankton samples were collected from selected sites. Pingers were tested to examine the effectiveness in river water to reduce accidental dolphin entanglement in fishing nets. A community based Dolphin Conservation Network (DCN) was developed for participatory dolphin and associated aquatic species conservation. Dolphin Yatra was conducted to raise mass awareness. Fish and fishery awareness campaign were conducted among fishermen of selected sites in collaboration with fishery department.

Results: Dolphin encounter rate was 0.21 (SE=0.02) dolphin/km in Kulsi River and 0.13 (SE=0.04) dolphin/km in Subansiri River in Monsoon season. Water quality monitoring and plankton sampling were conducted in Monsoon season at 25 sites. Testing and calibration of pingers is ongoing in Brahmaputra. 36 DCN members from 18 dolphin habitats were given extensive training on dolphin and associated aquatic species monitoring. Regular land based dolphin monitoring in these 18 sites by trained DCN members resulted into an encounter rate of 0.71 dolphin/km. Total 26 fish landing centers were surveyed. 13 economically important fish species were recorded. Dolphin Yatra was conducted in 20 sites, where about 2400 people participated. 10 fishery awareness programmes were conducted in collaboration with Assam Fishery Department, where about 400 fishermen participated.

Keywords: Dolphin monitoring, Dolphin Conservation Network, Dolphin Yatra, fishery awareness campaign

Project Title	:	Development of conservation action plan for River Dolphins (*Platanista gangetica gangetica*)
Principal Investigator(s)	:	Prof. Qamar Qureshi and Dr. S. A. Hussain
Researcher(s)	:	Dr. Abdul Wakid (Project Scientist), Sunny Deori (Project Fellow) and Anumitra Phukan (Project Fellow)
Funding Agency	:	National Compensatory Afforestation Fund Management and Planning Advisory Council
Project Duration	:	5 years (2016-2017)

River Dolphin Oil-bait Fisheries in Lower Assam- A Preliminary Assessment

-N. Leela Prasad

Aim: One of the reasons for the decline of Ganges river Dolphin *Platanista gangetica* population is the use of dolphin oil as a bait to catch a commercially important Catfish *Clupisoma garua* in parts of the Ganga and Brahmaputra basins. The study envisages to understand the dynamics of oil-bait fisheries thereby addressing this concern.

Location: The study was conducted in Dhubri and Sonitpur districts of Assam, India.

Methods: Seventy fishermen out of nearly eighty fishermen practicing oil-bait fisheries were interviewed using a semi-structured questionnaire in Dhubi char village, Dhubri district. A reconnaissance survey was conducted in Sonitpur district during the same period between April and May, 2017. Graphical analysis and summary statistics were used to interpret data.

Results: Oil-bait fishing is practiced by two communities in the Brahmaputra river from Dhubri in Assam to Pasighat in Arunachal Pradesh. An estimated crew of 3 to 4 fishermen fish in a boat. This fishing is carried out throughout the year. However, from November to February it is done during night and during rest of the year, it is done during day time. The catch is considerably higher during November to February compared to rest of the year. Alternative oils were introduced by various organisations over the years to reduce the dependence on Dolphin oil.

On a single fishing occasion, a minimum quantity of 5 to 20 grams of dolphin oil is used. Oil bait fishery is the primary occupation for 79% of respondents and secondary occupation of 21% respondents (n=70). Almost half (47%) respondents accepted that they are using dolphin oil at present and little more than half (53%) responded that they are not using dolphin oil at present (n= 70). Almost all of (98.5%) of the respondents are aware that using dolphin oil is illegal (n =70).

Keywords: Brahmaputra, Dhubri, Garua catfish, Sonitpur.

Project Title	:	Development of conservation action plan for Gangetic river Dolphins (*Platanista gangetica gangetica*)
Principal Investigator(s)	:	Qamar Qureshi (Principal Investigator), Dr. S.A. Hussain (Co-Investigator)
Researcher(s)	:	N. Leela Prasad (Project fellow)
Funding Agency	:	National Compensatory Afforestation Fund Management and Planning Advisory Council (MoEFCC)
Project Duration	:	2015-2020

Multi-Sectoral Use of River Water and Ganges River Dolphin Conservation: Issues Engagement with Key Stakeholders and the Way Forward

-Rashid Raza

The Endangered Ganges river dolphin (*Platanista gangetica*) lives only in large, perennial rivers in the Ganges-Brahmaputra basin. Adequate water volume, depth and complexity of the river channel are necessary conditions for its survival.

Large-scale extraction of water from the river chiefly for irrigation and in situ use of the river channel for industrial scale navigation are two contrasting examples, which serve to illustrate the multiple demands on the habitat of the river dolphins in the Ganga Basin

Diversion and extraction of water from rivers takes the form of irrigation canals, barrages, dams, numerous water pumps and results in reduced water flow. These practices have already resulted in big changes in river habitats and dolphin populations.

Development of industrial scale navigation in the Ganga, Brahmaputra and their major tributaries is a recent policy initiative. These require the rivers to be navigable for operation of up to 2000-ton barges, which makes chronic modification of river channel essential through dredging and channel modifications necessary. Since the dry season discharge in the Ganga (National water way-1) is only a fraction of the wet season, shoals and braided channels become a natural feature of the river. However to keep the main channel navigable with a depth of 3 m, extensive dredging and/or channel modifications are required. Additionally the noise from passage of dozens of large vessels will likely seriously disrupt the acoustic properties of the dolphin habitat. As the Ganges river dolphin exclusively relies on echolocation for navigation, communication and feeding this is a cause for serious concern. With high river traffic, risk of propeller strikes and collision with barges resulting in death or injury to dolphins may increase.

These issues and likely scenarios are illustrated with remote sensing information, preliminary field observation and comparisons with the analogous but recently extinct Yangtze river dolphin (*Lipotes vexillifer*) of China. With specific reference to river navigation development, engagements with key stake-holders and prospects of minimizing ecological damage through continued dialogue and exchange of information is discussed.

Project Title	:	Development of Conservation Action Plan for Ganges River Dolphin
Principal Investigator(s)	:	Qamar Qureshi (Principal Investigator), Dr. S.A. Hussain (Co-Investigator)
Researcher(s)	:	Rashid Raza (Project Scientist)
Funding Agency	:	National Compensatory Afforestation Fund Management and Planning Advisory Council, MoEF&CC
Project Duration	:	2016-2021

Population Trend of Gharial (*Gavialis gangeticus*) in the National Chambal Sanctuary

-Suyash Praful Katdare

Aim: Monitoring of population of a species of conservation concern is crucial for understanding the population trend. The project aims to monitor the ecological status of the Chambal River by focusing on water requirements of key aquatic species. In this study, an assessment of the current gharial population, its trend and relation with its habitat has been carried out.

Study Area: The National Chambal Sanctuary (NCS) covers a stretch of 600 km of the Chambal River from Jawahar Sagar Dam in Rajasthan to Panchnada covering 600 km stretch of the Chambal River. The study was carried out in the 435km section of NCS.

Methods: A boat survey was conducted in mid- February for population estimation of gharial. Based on ecological characters of the river, the NCS was divided into seven segments that were surveyed in daylight hours. Habitat parameters such as bank features, disturbances and water depth were recorded at every 2.5 km and for every gharial sighting. Nesting survey was conducted in two phases, first during late March to mid April to identify nesting sites and the second from late May to Mid June to count nests. A generalized linear model was used to identify factors affecting occurrence of gharial. The gharial population trend from 1985 to 2017 and from 2003 to 2017 was calculated in terms of change in population per annum by regressing the log of encounter rates.

Results: A total of 1512 gharials (3.47gharials/km) were recorded during the population monitoring. Adult gharials constituted 60.7% of the total population. A total of 402 nests (1 nest/km) were recorded during the nesting survey. Gharial occurrence showed negative relation with fishing and agriculture, and positive relation with sandy habitat. They appear to be tolerant to the current level of disturbance. The overall population showed a growth rate of 0.08% p.a from 1985 to 2017. The juvenile size class shows a negative trend [-1.9% p.a.]. From 2007 to 2017, the overall population growth rate was 4.1% p.a., the hatchling [-5.7% p.a.] and yearling [-0.5% p.a.] showed a negative trend. The next phase of the project will consist of studies on population genetics, temperature dependent sex determination and e-flow.

Keywords: River ecology, population structure, population growth, nesting ecology

Project Title	:	Ecological monitoring of Chambal river basin with special reference to water requirement of key aquatic species
Principal Investigator(s)	:	Dr. S. A. Hussain, Dr. Ruchi Badola and Dr. S. K.Gupta
Researcher(s)	:	Suyash Katdare (Senior Research Fellow), Surya Prasad Sharma (Junior Research Fellow)
Funding Agency	:	Grant-In Aid
Project Duration	:	2016 - 2019

Tigers and their prey in Dibang Valley District, Arunachal Pradesh: An update

-Aisho Sharma Adhikarimayum

Aim: The Mishmi hills landscape is unique in India for harboring tiger population at over 3630 m altitude, representing one of the very few temperate tiger habitats at such high elevation. This study was carried out to determine the distribution, abundance of tigers, co-predators and their prey species in and around the Dibang Wildlife Sanctuary; assess local people's attitudes and perceptions about conservation of tigers.

Location: The Dibang Wildlife Sanctuary in Arunachal Pradesh covers an area of 4149 km^2 and lies between 95^0 17' and 96^0 38' E and 28^0 38' and $29^0$27' N.

Methods: The Dibang Wildlife Sanctuary and adjoining landscapes were monitored for tigers, co-predators, and their prey through sign surveys, camera trapping and questionnaire based surveys from October 2015 to June 2017. Single sided camera traps were deployed in 3 km^2 grid sizes overing an area of 336 km^2 for a minimum of 60 days in three stratified blocks. 28 sign surveys were conducted and 120 households were covered in the questionnaire survey.

Results: 12761 traps nights resulted in 78 photographs of tigers and from these 11 individuals were identified. Highest occupied area was at 3630 m obtained from camera trap and 3783 m obtained from indirect evidence. Sign survey encounter rates were higher for tigers in Dri followed by Malinye and Mathun valleys. Mishmi Takin, the major prey of tigers was frequently captured from Dri and Mathun Valley. All respondents were positive about tiger conservation; however, expressed concerns about Mithun depredation by Tigers and Dhole.

Conclusion: These two years (2015-17) has helped us document and identify key areas for tiger occupied areas and its co-predators and prey species.Carnivore relative abundance and occupancy estimation will be carried out using camera trap data. Relative abundance index (RAI) will be used for deriving prey densities. Diet and food preference of tigers will be estimated from the scat analysis and kills. Future systematic long term research and monitoring of the entire landscape is being planned and will be undertaken.

Keywords: Mishmi hills, Idu, Mithun, Carnivores and Wildlife Interactions

Project Title	:	Establishing ecological baselines for long term monitoring of tigers, co-predators and prey species in Dibang Wildlife Sanctuary and its adjoining landscapes in Arunachal Pradesh, India
Principal Investigator(s)	:	Dr. Gopi. G. V, Dr. Y. V. Jhala and Qamar Qureshi
Researcher(s)	:	Aisho Sharma Adhikarimayum (Senior Research Fellow)
Funding Agency	:	National Tiger Conservation Authority, New Delhi
Project Duration	:	2014 - 2017

Predicting Swamp Deer Distribution in the Upper Gangetic Plains Using a Combination of Survey and Molecular Approaches

-Shrutarshi Paul

Aim: Information on swamp deer distribution outside protected areas in the upper Gangetic plains is limited. Our initial surveys revealed previously unreported swamp deer populations in human dominated areas. The aim of this current study is to predict swamp deer distribution using a reliable species distribution model, validate the predicted outcomes, and develop methods to generate individual level data for connectivity and inbreeding analyses. The modelling was performed using information from field survey as well as cost effective molecular approaches to identify species.

Location: The study area includes the upper Gangetic plains, covering states of Uttarakhand and Uttar Pradesh.

Methods: During surveys spanning over 6000 km^2 we had collected pellet samples and we designed swamp deer specific primers to identify them. Finally after spatial filtering and checking for autocorrelation among covariates, 90 location points comprising of direct sighting, antlers and genetically confirmed pellets and 13 appropriate covariates were fitted in Max Ent. Further, we tested a set of 48 microsatellites using a cost effective M13 approach to finalize a panel for swamp deer individual identification.

Results: The species distribution model predicted swamp deer presence in many areas outside our surveyed zones with high sensitivity (AUC= 0.954). Our validation survey in some predicted areas revealed swamp deer presence in them. Among covariates, annual mean temperature and NDVI were the major contributors to swamp deer occurrence. Human footprint and elevation negatively affected swamp deer occurrence. We finalized a panel of 16 polymorphic microsatellite loci for swamp deer individual identification.

Conclusion: The swamp deer distribution model is robust and accurate in predicting its presence as proved by our validation surveys. Further surveys and individual level genetic data will be essential to understand critical population parameters. Max Ent established the fact that protection of grasslands along Ganga from JJCR to HWLS should be a priority.

Keywords: MaxEnt, modelling, grassland conservation, Gangetic plains, non-protected area. individual identification

Project Title	:	Movement patterns and inbreeding status of swamp deer (*Rucervus duvaucelii*) at Uttarakhand, India
Principal Investigator(s)	:	Dr Samrat Mondol, Dr Bivash Pandav, Dr Bilal Habib, Dr Parag Nigam and Dr Dhananjai Mohan
Researcher(s)	:	Shrutarshi Paul (DST-Inspire Junior Research Fellow)
Funding Agency	:	Uttarakhand Forest Department, Department of Science and Technology
Project Duration	:	2016 - 2018

Preliminary Findings of Seasonal and Habitat Influence on Bird Species Richness and Distribution Pattern in Sahyadri Tiger Reserve

-Surabhi Sati

Aim: To determine the habitat utilization pattern, influence of seasonal variations on diversity and composition of avifauna in Sahyadri Tiger Reserve.

Study Area: The study was conducted in Sahyadri Tiger Reserve with an area of 1, 166 km^2. The reserve comprises of two Protected Areas *viz.* Koyna Wildlife Sanctuary in the North (423.55 km^2) and Chandoli National Park in the south (317.67 km^2) and adjoining area of 424.34 km^2.

Methods: In total 150 points were sampled, spaced nearly 1km apart using variable point counts between 16th October and 17th June to survey avian diversity. Each point was replicated thrice in autumn, winter and summer. At each point the birds were counted for 20 minutes within 50m radius which was preceded by stationary five minutes. All birds seen and heard at each point were recorded.

Result: 12,248 individual birds of 206 species belonging to 63 families were recorded. These include seven endemic species and a first time record of Legge's hawk eagle (*Nisaetus kelaarti*) in the study area. Shannon-Wiener diversity index (H'), in autumn ranges between 3.87 (forestland) and 3.59 (shrubland), in winters between 3.83 (agricultural land) and 3.33 (shrubland) and in summer between 3.73 (agricultural land) and 3.33 (shrubland). The abundance of birds found to be between 108.81 ± 6.83 to 42.964 ± 3.52 km^{-2}in autumn (highest- agricultural land, lowest-grassland) and in winter the abundance of birds found to be between 123.58±7.00 to 54.82±3.81 km^{-2} (highest-agricultural land, lowest-grassland) while it is contrary in summers the abundance of birds found to be between 90.287±6.90 km^{-2} to 57.061±6.46 km^{-2} (highest- grassland, lowest-agricultural land). However in all seasons, mean bird abundance per species count was higher in agriculture and least in grassland.

Conclusion: The initial findings from this study provide evidence that agricultural land areas can serve as a refuge for birds. Therefore, conservation efforts for birds should also be focused towards the human occupied areas in addition to forest protected area.

Keywords: abundance, avifauna, diversity, Sahyadri tiger reserve, species richness.

Project Title	:	Ecological Reconnaissance and Conversation Assessment of Avifauna in Sahyadri Tiger Reserve.
Principal Investigator(s)	:	Dr.Gopi G.V
Researcher(s)	:	Surabhi Sati (Project Biologist)
Funding Agency	:	Sahyadri Tiger Reserve, Maharashtra
Project Duration	:	2016 - 2018

Amphibians of Panna Tiger Reserve: Diversity, Ecology and Population Monitoring

-Vishal Kumar Prasad

Aim: Amphibians are the most threatened vertebrate group of animals globally. Evaluating their species diversity, richness along with identifying suitable niche habitats adds to the baseline data for population monitoring of species of conservation importance. It has been seen in the past that species have gone extinct even from protected areas so it becomes essential part of wildlife management to identify the diversity and present status of species at risk. It helps to pathway local to landscape level management strategies for species conservation. We initiated the first ever scientific and systematic documentation of amphibians in Panna Tiger Reserve to investigate the species richness, estimating abundance, body size distribution, diversity, richness and ecology.

Location: Our study area covers broad leave dry deciduous forests with mix habitats of plateaus, grasslands, riverine and swampy valleys and agricultural lands covering area of approx. 542 square kilometers. We have sampled three ranges i.e. Panna, Madla and Hinota in last one month and continue to cover more ranges in future.

Methods: We standardized herpetofauna monitoring protocol which includes Nocturnal Visual Encounter Surveys (NVES) technique along with Belt transect Surveys at breeding sites of frogs and toads where in a transect of 100 meters along the course of waterbody is covered by walking by two field personnel w.r.t. to time. All the species encountered during the survey are recorded with their habitat details. We also conducted Quadrat Sampling for amphibian tadpoles. Weather and GPS data of each site is recorded.

Result: Our field work is for the entire monsoon season till October 2017. We have obtained 13 amphibian species from five families of amphibians. Along with this we obtained the data on species relative abundance. The effort curves of different ranges shows more sampling are required to cover all the species of that habitat. This study shows *Fejervarya sp*. and *Euphlyctis cyanophlyctis* are most abundance and widespread. However *Uperodon sps*. and *Fejervarya sp. 2* are least abundant. It needs more detailed assessment to conclude.

Conclusion: This is too early to conclude since the study is going on. However, this study is first ever scientific and systematic documentation of herpetofauna in unexplored Central Indian landscape from herpetofauna point of view. This may uncover novel species, rediscovery, identifying direct or indirect threat (such as any disease) and population monitoring of several amphibian species of Central India. The results from the study will improve our understanding of species-habitat relationships, and provide quantitative information on population.

Keywords: Amphibian, Tiger Reserve, Diversity, Monitoring, Population, Panna

Project Title	: Diversity and Ecology of Herpetofauna of Panna Tiger Reserve
Principal Investigator(s)	: Dr. Abhijit Das (Principal Investigator) and Sreenivas Murthy (Co-Investigator)
Researcher(s)	: Vishal Kumar Prasad (Project Biologist)
Funding Agency	: Madhya Pradesh State Biodiversity Board, MPSBB
Project Duration	: 2017 - 2019

Carnivores of the Light and Darkness: Activity Pattern, Habitat Use and Niche Segregation in a Tropical Semi-Evergreen Forest, Assam

-Urjit Bhatt

Aim & Study Area: The role of resource partitioning by sympatric species for coexistence is a fundamental question in carnivore ecology. Sympatric species have different activity and habitat use patterns which in recent times has been effectively studied through the use of camera traps. We studied activity patterns, niche segregation in terms of space and time of various carnivores to understand how the carnivore guild in Manas National Park (MNP), a semi-evergreen forest potentially exploit resources.

Methods: A preliminary survey was initiated with open and close ended interviews with the forest officials (n=75). Camera traps (n=112) in a 1X1 grid were deployed in all three ranges covering an area of 110 km^2 during the month of April to June 2017. Habitat parameters such as forest type, terrain type, canopy cover and disturbance parameters were recorded at each camera-trap site. Activity patterns were determined using *kernel density estimation*. Furthermore, to investigate niche overlaps we used *pianka's index*. A generalized linear model was used to detect influence various parameters on relative abundance of carnivore species. The data were analysed in *R 3.4.1* using the package "*density*" and "*overlap*".

Results & Conclusion: Questionnaire surveys revealed presence of a total of seven carnivore species to have been seen by forest patrol staff. Most common carnivore seen was leopard. Clouded leopards were reported in all three ranges over the course of 13 years in the northern boundary of MNP (Doimary, Mathanguri, Kheroni & Latajhar). Photographic captures through camera traps recorded a total of 25 mammalian species; of which tiger, clouded leopard, leopard cat, large Indian civet, small Indian civet and common palm civet were classified as carnivores of the darkness (nocturnal), while leopard, dhole, black bear, crab-eating mangoose and small Indian mongoose were carnivores of the light (diurnal). Various activity and space use patterns suggest that large predators were significantly associated with relative abundances of large prey. We also report the confirmation of chital (*Axis axis*) after two decades from Panbari range of MNP. The results suggest carnivores have localized patterns of behaviour which are exhibited in MNP that is influenced by resource availability and partitioning within various guilds. Further intensive field efforts will be carried out at next stages.

Keywords: *Neofelis nebulosa*, guild, nocturnal, diurnal

Project Title	:	Ecology of clouded leopard (*Neofelis nebulosa*) in an east Himalayan biodiversity hotspot
Principal Investigator(s)	:	Salvador Lyngdoh and Dr. Bilal Habib
Researcher(s)	:	Urjit Bhatt (Junior Research Fellow)
Funding Agency	:	Department of Science & Technology, Govt. of India
Project Duration	:	2016 - 2019

Developing genetic database to understand metapopulation dynamics and connectivity of tigers and other large carnivores across tiger landscape of Maharashtra: Preliminary Insights

-Shrushti Modi

Aim: Habitat fragmentation and its effects is one of the burning issues in current wildlife conservation research. Habitat fragmentation leads to decrease in connectivity, leading to isolation in extreme cases. Large carnivores being at the top of the trophic level and having a large home range size are affected the most due to habitat fragmentation. Determination of effect of connectivity loss in large mammals is challenging. Use of genetics with non-invasive samples is advantageous due to large sample access at spatio-temporal level. Central Indian landscape harbours four large carnivores i.e. tiger, leopard, dhole and sloth bear having different tolerance to level of habitat fragmentation owing to their different ecology. The aim of this study is to evaluate the effect of habitat fragmentation on these four large carnivore species.

Location: The study area covers all tiger reserves and connecting areas in Maharashtra including Pench Tiger Reserve (Maharashtra), Tadoba-Andhari Tiger Reserve, Navegaon-Nagzira Tiger Reserve, Melghat Tiger Reserve, Sahyadri Tiger Reserve, Umred Karandhla WLS, Tippeshwar WLS and Brahmpuri Forest Division.

Methods: Part of the study area was intensively surveyed for fecal collection. Samples were collected with GPS locations and stored in -20 degree Celsius. DNA was extracted using already standardized approaches. For tiger and leopard we performed species identification, molecular sexing and individual identification using existing approaches. For dholes we developed a novel species and molecular sexing approach, and tested a panel of 12 microsatellites for individual identification.

Results: During the first year we have collected a total of 517 fecal samples from all four target species, and processed 317 samples till date. From all the processed samples, we identified 38 tiger, 15 leopard, and 127 dhole scats. We finalized a panel of 12 microsatellites for dhole identification. Final standardizations for individual identification of all species are ongoing.

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

Project Title	:	Developing genetic database to understand metapopulation dynamics and connectivity of tigers and other large predators across tiger landscape of Maharashtra, India
Principal Investigator(s)	:	Dr. Bilal Habib & Dr. Samrat Mondol
Researcher(s)	:	Shrushti Modi, (Junior Research Fellow)
Funding Agency	:	Maharashtra Forest Department
Project Duration	:	3 years

Genetic Characterization of Whale Shark (*Rhincodon typus*, Smith, 1828) around Gujarat Coast, India

-Bheem Dutt Joshi

Aim: Whale shark (*Rhincodon typus*) is one of the largest aquatic fish and distributed in all tropical and warm temperate seas except the Mediterranean. The aim of the study is to characterize genetic structure of Indo-Pacific Whale shark population off Gujarat coast using a mitochondrial genome and multi locus genotyping. We provide base line information for the species.

Location: We collected whale shark tissue samples off Gujarat coast (n=18) and east coast (n=1).

Material and Methods: DNA was extracted using the commercially available kit (QIAGEN, Germany). We characterized genetic structure using Cytochrome oxidase I (COI; 650bp) and mitochondrial control region (mtCR; 1250bp), of mtDNA genome and 12 microsatellite loci. PCR was carried out using the standard procedures.

Results: DNA from all 19 samples were extracted successfully. Analysis of COI and CR revealed the presence of 2 and 13 haplotypes respectively in Indian coast. Phylogenetic tree indicated that these 13 haplotypes of CR were distributed in four clades. Compilation of other published data indicates the presence of 6 and 208 haplotypes in COI and CR region respectively. Our analysis indicates absence of any geographic structuring in the populations in Indo-Pacific Ocean but marginally found with the Atlantic Ocean based on network and phylogenetic tree. Global data on CR region indicate that 73% haplotypes were regionally localized with the range of species whereas remaining were shared between 2 to 7 countries/oceans. Multilocus genotyping data reveals 2 to 10 alleles per locus whereas mean the effective number of alleles was 2.4. Mean observed heterozygosity (Ho) and mean expected heterozygosity (He) were 0.4 and 0.5 respectively.

Conclusion: We suggest conservation implications and future suggestions to get a better insight of the species with more samples analysed and scientific information obtained the current effort of conservation of the species in the Indian offshore waters can be further improved.

Keywords: Mitochondrial DNA, Control region, Phylogenetic

Project Title	:	Phylogeography and population genetic structure of the whale shark (*Rhincodon typus*, Smith, 1828) off the Gujarat coast, India
Principal Investigator(s)	:	Dr. S.P. Goyal, Dr. Dr. K. Sivakumar and Dr. J.A. Johnson (Principal Investigators), B.C. Choudhury and Sajan John (Collaborators)
Researcher(s)	:	Dr. Bheem Dutt Joshi (Research Associate) and Rahul De (Project Assistant)
Funding Agency	:	Wildlife Trust of India, Noida, India
Project Duration	:	_

Molecular Data Revels Genetic Sub-Populations of Tiger in the Terai-Arc landscape, India

-Suvankar Biswas

Aim: The Terai-Arc landscape is one of the few remaining strong holds of wild tigers across the globe, where their future survival is depended on conservation actions focusing at landscape level. This study aims to combine field, GIS and molecular tools to investigate tiger meta-population dynamics across the landscape. We will focus on our initial understanding of habitat fragmentation and its effect on current tiger populations at a landscape level.

Study area: Indian part of Terai-Arc landscape, covers the states of Uttarakhand, Uttar Pradesh and Bihar. This area retains about 15000 sq. km. potential tiger habitat in India.

Methods: To assess tiger spatial distribution patterns and sex ratio across western and central Terai-Arc landscape, we extensively collected large carnivore feces and identified tiger samples using already standardized species-specific molecular approach. Further, to characterize the genetic signatures of current tiger population of this landscape, we identified unique individual tigers using 13 microsatellite loci and generated genotype frequency data from majority of the landscape.

Result: So far, we have ascertained 462 tiger and 364 leopard scats from our field-collected feces, and identified 131 unique tigers across Uttarakhand and Uttar Pradesh. The calculated $P_{ID(sibs)}$ (Probability of identity for sibling) value was $5.5*10^{-6}$, assuring unambiguous individual identification of tigers with high statistical support from faecal samples. Allelic richness or number of alleles per locus varied from 05 to 14 (10.846±2.413), allelic size range (33±11.741) and observed heterozygosity (0.30711±0.15264) in these individuals. Our subsequent analysis revealed two distinct genetic subpopulations divided along Gola river corridor across western and central TAL. This genetic division is driven by severe anthropogenic disturbances along the corridor.

Conclusion: The result revealed a dysfunctional corridor in the western-central TAL region causing a gap in genetic connectivity along Gola river. Future sampling in Bihar would reveal if any such disconnectivity is present in eastern TAL. Additionally, more fine scale analysis of within region gene flow and inbreeding status will be conducted.

Keywords: Terai Arc landscape, tiger, connectivity, functionality of the corridor, population structure.

Project Title	:	Meta-population dynamics of tigers in the Terai-Arc landscape, India
Principal Investigator(s)	:	Dr. Samrat Mondol (Principal Investigator), Dr. Bivash Pandav, Dr. Gautam Talukdar (Co-Investigators)
Researcher(s)	:	Suvankar Biswas (Junior Research Fellow)
Funding Agency	:	WCT-Panthera Global Cat Alliance Funds and DST, Government of India
Project Duration	:	2014 - 2019

Insight into RhODIS

-Tista Ghosh

Aim: The Rhino DNA Indexing System or RhODIS is a rhino conservation program where the aim is to build a DNA database of the existing rhino population to aid rhino poaching and traffic related convictions and additionally help in population management.

The greater one-horned rhinoceros (*Rhinoceros unicornis*) populations are now mostly confined to restricted patches in India and Nepal. Their population decline is driven by habitat loss and poaching. With an existing population of approx. 3500 individuals across the subcontinent, continuing anthropogenic interventions take a heavy toll on long-term survival of this large mammal. Currently focus of the RhODIS-India program is to create a genetic database for Indian rhinos which will help to (i) locate poaching hotspots by detecting origin of seized rhino horns; and (ii) understand genetic status of present rhino population to facilitate population management of rhinos.

Study Area: Rhino bearing areas across the states of Assam, Uttar Pradesh and West Bengal

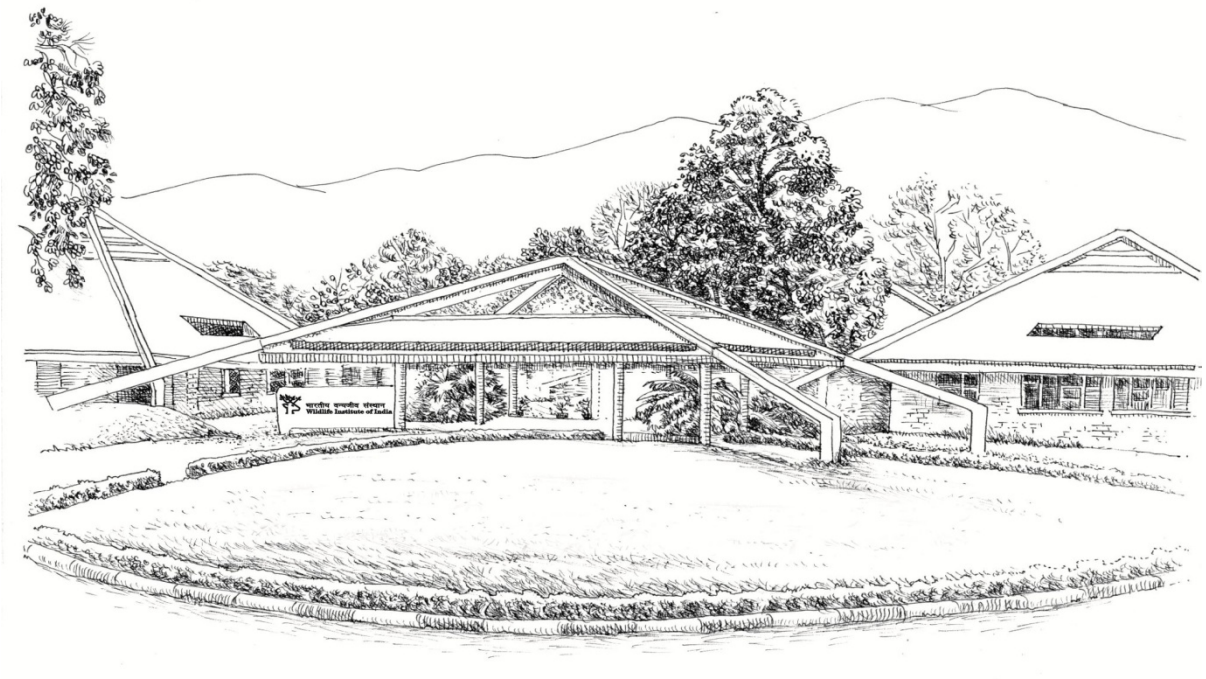
Methods: In the initial phase of the project, we have focused on standardization of microsatellite markers based on 19 reference tissue samples provided by Forest department of Assam. During selection of markers two aspects were considered; (a) testing a large number of marker to find polymorphic loci (b) select the final panel that provide high statistical power in forensic and population genetic analyses. Programs CERVUS and GIMLET was used to analyse genetci data from reference tissue samples.

Results: We have finalized a panel of 14 microsatellite loci with a PID(sibs) value of $6.7X10^{-5}$. By using this panel, we have done genotype matching of one seized sample from Kaziranga National Park to one of the reference samples that were provided to us by forest department of West Bengal.

Conclusion: This panel of 14 microsatellite loci can be used for unambiguous individual identification of rhinos and information can be produced in the court.

Keywords: One-horned Rhinoceros, Habitat loss, Poaching, Population management, Microsatellite markers

Project Title	:	Implementing Rhino Indexing System (RhODIS) to counter rhino poaching threat and aid population management in India
Principal Investigator(s)	:	Dr. Samrat Mondol
Researcher(s)	:	Tista Ghosh (Junior Research Fellow)
Funding Agency	:	WWF-India
Project Duration	:	2017-2019



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