भारतीय वन्यजीव संस्थान
Wildlife Institute of India

ENDANGERED SPECIES RECOVERY PROGRAMME

Tuesday, 18th September 2018

PROGRAMME

Seminar Chairperson: Dr. P.K. Mathur, Former Dean, WII

INAUGURAL SESSION

0915 – 0919 h   Welcome

Dr. K. Sivakumar, Scientist-F, WII

0919 – 0927 h   Opening Remarks

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

0927 – 0930 h   **Release of WII Publications**

S.No.	Title of Publication	Released by	Assisted by
1	Framework for Evaluating Ecosystem Services of Ganga River	Dr. P.K. Mathur, Former Dean, WII & Seminar Chair	Dr. Ruchi Badola, Scientist-G & Ms. Amanat Gill
2	Binding Roots: Trees of Ganga	Dr. Sandeep Behera, Consultant, NMCG	Dr. B. S. Adhikari Scientist-F & Sayantika Banerjee

TECHNICAL SESSION – I
TERESTRIAL SPECIES

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

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

2. **Dr. Bilal Habib, Scientist-E**

0930-1015   Roads travelled and distances to cover for recovery of endangered bustards

Dr. Sutirtha Datta, Scientist-D

1015-1100	Implementation of action plan for conservation of Manipur's brow antlered deer or *Sangai*: An update
	Dr. Chongpi Tuboi, Project Scientist
1100-1115	**Discussion & Remarks by Chair and Co-Chairs**
1115-1130	**Tea**

TECHNICAL SESSION – II
AQUATIC SPECIES

Chair   :   Prof. Qamar Qureshi, Scientist-G

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

2. Dr. J.A. Johnson, Scientist-E

1130-1215	Understanding Distribution, Abundance & Anthropogenic Stressors of Gangetic River Dolphin in Ganga - Brahmaputra System
	Dr. Rashid H Raza, Project Scientist
1215-1300	Conserving the seagrass sentinels: an update on the Dugong Recovery Program
	Dr. Anant Pande, Project Scientist
1300-1315	**Discussion & Remarks by Chair and Co-Chairs**
1315-1325	**Concluding Remarks by the Seminar Chairperson**
1325-1330	**Vote of Thanks**
	Dr. K. Vishnupriya, Scientist-C
1330 – 1430	**LUNCH**
1430 – 1730	**POSTER SESSION**
	25 Posters

CAMPA Seminar Programme: List of Posters

S. No.	Title	Presenter
1.	'Connecting the dots: 'Sensitization' as a key factor in Dugong Conservation'	Himani Saini
2.	Use of advanced technology for monitoring Gangetic River Dolphin and its habitat	Sajal Sharma
3.	Habitat assessment of River Subansiri, Assam with reference to plankton: A preliminary study	Anumitra Phukan
4.	Preliminary assessment of parasitic richness in select ungulates of Keibul Lamjao National Park, Manipur	Dr. M. Vikramjit Sharma
5.	Socio-economic status of the fishing community around the Pumlen lake	Ak. Santikumar Singh
6.	Species identification using molecular techniques revealed misidentification of fecal pellets based on pellet morphology	Mirza Ghazanfar Ullah Ghazi
7.	Spatial Utilization of Manipur Brow-antlered deer and Hog deer in Keibul Lamjao National Park (KLNP), Manipur	Sijagurumayum Rohikanta Sharma
8.	Status of Dugongs and seagrasses in the Gulf of Kachchh, South West	Sameeha Pathan,
9.	Uncharismatic habitats: studying seagrass ecosystems in a coral-centric marine world	Swapnali Gole
10.	Abundance and distribution of Ganges River Dolphin (*Platanista gangetica gangetica*) in Brahmaputra River System	Ashwin Warudkar & Sunny Deori
11.	Assessment of fish fauna associated with sub-tidal seagrass meadows of Andaman and Nicobar Islands- a case study	Sohini Dudhat
12.	Characterization of shipping noise with respect to the acoustic habitat of River dolphin	Gargi Roy Chowdhary,
13.	Phylogeography and Population Genetics of Great Indian Bustard and Dugong	Srinivas Yellapu
14.	Dugongs, Seagrasses and the Community: studies on parts of the Tamil Nadu coastline	Rukmini Shekar and Madhu Magesh
15.	Lesser needs greater attention: status assessment and conservation challenges of Lesser Florican across breeding range	Dr. Sujit Narwade
16.	Tracks on the sands of time: Long-term ecological monitoring of Thar	Bipin C. M.
17.	Hidden costs of green energy: bird mortality due to expanding power-line network in Thar desert	Mohib Uddin
18.	Friend turned foe: impacts of free-ranging dogs on livelihoods and native fauna of an arid ecosystem	Devendradutta Pandey

19.	Hearing unheard voices and the incubation of a breeding center: milestones achieved in outreach and ex-situ components of bustard recovery program	Tanya Gupta and Tushna Karkaria
20.	Understanding the dynamics of two major threats to Ganges river Dolphin in Brahmaputra	N Leela Prasad
21.	People's perception about conservation of River Dolphin: Dialogue with stakeholder communities	Shovana Ray
22.	Release of Anthropogenic runoff into Riverine Ecosystem : The Ultimate Sink	Ishi Narula & Vineet Singh
23.	Mapping the habitat characteristics of Brahmaputra River and its relationship with river dolphin	Merin Jacob, Rajat Rastogi, Priyamvada Bagaria
24.	Challenges in mapping the grassland habitats of highly endangered species of both marine and desert ecosystems	Priyamvada Bagaria
25.	Distribution and Abundance of the Ganges River Dolphin *(Platanista gangetica)* in the Ganges River System	Naman Goyal

Roads travelled and distances to cover for recovery of endangered bustards

-Sutirtha Dutta

Conservation based on robust science has greater chance of success. Under Endangered Species Recovery Program, WII partnered with Forest Departments and NGOs to implement science based bustard recovery actions.

We present first two years' activities that were implemented across species' ranges, focusing on Thar that harbours the only viable Great Indian Bustard population.

Our project adopts a multi-pronged approach that includes, a) developing conservation breeding center, b) identifying conservation areas and threats through ecological surveys, c) testing and demonstrating pilot measures to restore habitats, and d) conducting outreach to garner stakeholder support for conservation.

Towards *ex-situ* measures, the Memorandum of Understanding has been signed, lands are being allocated to construct facilities, and collaboration with international bustard breeding centers for expertise and training is being formulated. To aide *in-situ* efforts, large-scale bustard surveys were conducted in Thar and Maharashtra that yielded population sizes of 128 (19_{SE}) and <8 individuals, respectively. National status of lesser florican was assessed to be 340 ($162-597_{CI}$) males; highlighting its critical condition and conservation hotspots. Radio-tracking of free-ranging dogs showed 22 (7.6_{SE}) chinkara predation/dog/year that indicates potential negative impacts on the associated bustard. Power-line surveys showed mortality of ~1 lakh birds/year belonging to $\geq$30 species, including ~18 GIB annually, in 4200 km^2 habitat in Thar. Ranging patterns of two tagged bustards helped in fine-tuning mitigation areas. Questionnaires revealed a diffused set of problems for people in/around Desert National Park that included but transcended land-use restrictions; leaving scope for conservation reconciliation.

To mitigate risky power-lines, we mapped infrastructure and sensitized power agencies that resulted in pilot-installation of our prototype bird diverters in Thar. Following our recommendations, breeding sites were chain-link fenced by the Department, but must be reinforced with effective nest-predator management that includes and exceeds dog sterilization, as planned by us. Through meetings with Indian Army, we gained access for conservation efforts in Pokhran Field Firing Range that harbours highest number of bustard. With the accumulation of evidence required for targeted mitigation, our future activities will focus on outreach/advocacy to translate science into actions at larger scales.

Keywords: *Ardeotis nigriceps, ex-situ*, grasslands, *in-situ*, threats

Implementation of action plan for conservation of Manipur's brow antlered deer or Sangai: An update

-Dr. Chongpi Tuboi

The Sangai (*Rucervus eldii eldii*) occurs as a single, small, isolated population making it vulnerable to extinction. A population of less than 200 breeding individuals and threatened habitat in a single small protected area leave little reason for long-term optimism. Therefore, the Sangai conservation programme aims to (a) Secure the existing population in Keibul Lamjao National Park, (b) Create a second population at the select site and (c) Involve local communities in conservation process.

An integrated management plan of KLNP has been prepared which is under review. Research and habitat monitoring activities are being carried out in the Park. Establishment of the conservation breeding centre is under progress.

To create a second population in the wild, conservation actions have been initiated at the Pumlen Pat and Thongam Mondum Conservation Reserve, Manipur. Intensive lobbying was carried out through meetings, workshops, trust building activities and awareness programmes. A total of two state level workshops, one site level and nine village level meetings have been conducted. During the 6th and 7th State Board for Wildlife meetings in 2017 and 2018 respectively, the Manipur Government has reiterated its commitment for establishment of a second population of Sangai at the proposed site. This area comprising of around 67.8 km^2 has been set aside for declaring the first conservation reserve in Manipur for Sangai conservation and sustainable development of the area.

The people living around Pumlen are dependent on the lake for their livelihood. They are reluctant to forego their activities in the absence of alternate livelihood sources. Sensitization of the local communities and other stakeholders including representatives from government departments, bureaucrats and legislators and trust building exercises is being carried out. In addition, livelihood training camps, exposure visits and awareness programmes are being conducted.

Keywords: Sangai, reintroduction, second home, community participation, advocacy

Understanding Distribution, Abundance & Anthropogenic Stressors of Gangetic River Dolphin in Ganga - Brahmaputra System

-Dr. Rashid H. Raza

The Endangered Gangetic river dolphin (GRD) *Platanista gangetica gangetica* is distributed in the Ganga-Brahmaputra river system in India. Considering its declining population and iconic status, the CAMPA-Dolphin project was launched to address the conservation challenges by the species. Consolidated project objectives are defined in two broad, synergistic themes;

A: Ecological monitoring
i)   To develop a monitoring protocol for Ganges river dolphins and associated riverine fauna.
ii)   Quality assessment of river habitat in terms of water quality, anthropogenic pressure and landscape surrounding river scape.

B: Participatory conservation planning and action
iii)   Involve stake holders to develop a network which will assist in Ganges river dolphin conservation.

The presentation updates on the studies carried out to fulfil these objectives.

Status surveys in the dry season have been completed in the Ganges-Brahmaputra mainstem and major tributaries of the Brahmaputra (Ganga:Buxar-Farakka-Gangasagar, Least count 1232, Brahmaputra: Sadiya-Dhubri and tributaries, Least count: 821). Most of the survey has used the robust Double observer method. In some segments Single observer surveys have also been used. From mark-recapture based statistics it is estimated that on average 25% of animals are missed by single observer surveys. In order to understand seasonal movement patterns, summer season surveys have been carried out in all major tributaries of the Ganga in Bihar.

Passive Acoustic Monitoring devices have been used to understand the habitat use and activity pattern of the GRD. Week long continuous monitoring in high density areas indicates that dolphins are present throughout the 24 hrs. Extensive spatial deployments indicate continued absence for as long as 6 hrs. Recording and analysis of anthropogenic noise from shipping and other sources have been done to understand the magnitude of noise pollution in the underwater acoustic habitat. Though most of the noise generated by ships are in lower frequency bands, overlap with frequency bands actively used by GRD for echolocation is also present. Advanced instruments have been tested and used for mapping and monitoring of benthic habitat and water quality. A Spatial database from remote sensing has been created to map key elements of river geomorphology important for the dolphins.

Detailed sociological studies have been carried out to assess the perception regarding dolphins so as to address the killing of dolphins.

Project Title	: Development of Conservation Action Plan for Ganges River Dolphin
Principal Investigator(s)	: Prof. Qamar Qureshi, Prof. S. A. Hussain, Dr. Vishnupriya Kolipakkam
Researcher(s)	: Scientist: Wakid A, Rashid, R, Shovna R, Fellows: Anumitra P, Ashwin W, Gargi RC, Kanad R, Leela P, Merin J, Naman G, Rajat R, Sunny D, Genetics: Srinavas Y GIS: Priyamvada B Prj Assistant : Ajay G, Assoc-EcoTox: Vineet S
Funding Agency	: Compensatory Afforestation Fund Management and Planning Authority (CAMPA)
Project Duration	: 2016-2021

Conserving the seagrass sentinels: an update on the Dugong Recovery Program

-Anant Pande and CAMPA-Dugong Team

Dugong populations in India are threatened with extinction. Unreliable population estimates, scarce understanding of species distribution, exacerbated loss of seagrass habitats, severe lack of conservation awareness and an untrained frontline forest staff define the challenges for dugong conservation in India. The Dugong Recovery Program was initiated in 2016 to generate baseline data on dugong demography, habitat status, seagrass health parameters and to enhance awareness about the species on a large scale with the involvement of all stakeholders. Another significant goal of the program is to equip the frontline forest staff to document and monitor marine biodiversity and improve their capacity to deal with net entanglements and strandings.

The project has been under implementation at three Dugong range states of the country i.e. Gujarat, Tamil Nadu and Andaman & Nicobar Islands.

In the last two years of the program, we investigated habitat characteristics, conducted outreach programs and organized capacity building trainings in Dugong range states. We conducted intensive Line Intercept Technique surveys (n = 132, comprising 849 quadrates) to understand seagrass meadow characteristics for prioritizing areas for long-term monitoring. Our study revealed presence of 13 species of seagrasses (Andaman Islands = 8, Tamil Nadu = 7 and Gujarat = 6) belonging to 6 genera. Mean seagrass cover was highest at Tamil Nadu (69.47±2.97 %) followed by Gujarat (23.75±2.69 %) and Andaman Islands (21.6±3.54 %). Algal cover showed reverse trend with Andaman Islands consisting of highest cover (28.69±4.77 %). We assessed seagrass associated macrofauna and identified about 59 fish species and 7 taxonomic groups of macrofauna. Through an extensive Dugong Volunteer Network, we reported 19 dugong strandings over last 18 months (16 at Tamil Nadu, 2 at Gujarat and 1 at Andaman Islands). Fishermen and divers reported maximum dugong occurrence information (> 51%) on a regular basis adding up to the primary species distribution data.

With this baseline information from dugong distribution range, an intensive sampling approach for assessing habitat parameters, threat intensity and distribution mapping is the next step for affirmative conservation action. We have standardized protocols and generated enough background data to initiate site-specific population and habitat monitoring for a multi-stakeholder based marine spatial planning of last remaining dugong habitats.

Keywords: Habitat assessment, Stakeholders, Marine Spatial Planning

Project Title	: Recovery of Dugongs in India: An integrated participatory approach
Principal Investigator(s)	: K. Sivakumar and J.A. Johnson
Researcher(s)	: Anant Pande, Project Scientist
Funding Agency	: MOEFCC
Project Duration	: 2016-2021

'Connecting the dots: 'Sensitization' as a key factor in Dugong Conservation'

-Himani Saini

For success of any marine conservation program, support of the local communities is the most crucial factor. As these communities are dependent on the local resources, their knowledge serves as a vast repository for carrying out research and conservation. Dugongs have been threatened throughout their distribution range in India and support of locals is vital in their conservation. Thus, with an aim to document local knowledge on dugongs and seagrass habitats, social surveys were conducted. Further, to understand community perception towards dugongs, a need was felt to sensitize and raise awareness about the species at the local, regional and national level. The outreach and awareness programs were conducted in all three dugong distribution ranges in India viz: Gujarat, Tamil Nadu and Andaman & Nicobar Islands.

We used a unique incentivization approach to involve fishermen in conservation activities by starting a Dugong Scholarship Scheme to engage local fisher folk and their children at grass root level. The dugong volunteer network called 'Friends of Dugong' involving more than 100 members from different stakeholders has been formed to report dugong sightings/strandings. Capacity building programs were conducted to sensitize the stakeholders about marine biodiversity, enhancing their capacity to enforce protection and implement monitoring of key habitats. Marine mammal stranding response training workshops were conducted with the frontline forest staff and local communities to report sightings and give first aid response to stranded marine mammals including dugongs.

Dugong distribution maps were generated based on secondary data given by dugong volunteering network. Through 53 diverse outreach events we have sensitized 11,289 people from various stakeholders. Dugongs were considered a priced catch, but due to awareness efforts and compensation program, three net entangled dugongs were reported and rescued successfully in Tamil Nadu by local fishermen. Our sensitization programs have helped connect different stakeholders through a participatory approach for dugong conservation.

Keywords: Dugong scholarship, dugong rescue, community incentivization, participatory approach

Project Title	: Recovery of Dugongs and their habitats in India: An integrated participatory approach
Principal Investigator(s)	: Dr. K.Sivakumar, Dr. J.A Johnson
Researcher(s)	: Himani Saini (Project Assistant)
Funding Agency	: CAMPA
Project Duration	: 2016 – 2021

Use of advanced technology for monitoring Gangetic River Dolphin and its habitat

-Sajal Sharma

The endangered Gangetic River Dolphin *Platanista gangetica gangetica* inhabits turbid river systems that makes their observation and studies for its conservation seriously deficient. Hence advanced technological (pre-designed and customized) tools provide a method for the effective study of its ecology and resource utilization.

Aiming to understand the ecology to mediate its conservation, we integrate ecological sampling and advanced technology. We developed specialized sensors, Passive Acoustic Monitoring devices (PAMs), and various SONAR devices to assist in data collection and mapping the river habitat. The below mentioned equipment have been developed and others procured.

Equipment Development

Design and development of water parameter measurement equipment for distribution in schools situated near the river banks as a part of Citizen science program, individual data loggers for water temperature, water flow, atmospheric temperature, pressure, humidity and GPS (latitude and longitude). All the developed data loggers store the information in a micro SD card having sensor data along with the real time clock information (time and date).

Passive Acoustic Monitoring (PAM) equipment:

C-POD are being used to understand broadband sound spectrum; Hydrophone (C57) are being used to sample river ambient noise, characterizing vessel noise and recording dolphin clicks, and Acoustic tag are specialized towed devices to understand dolphin habitat use and activity.

River Habitat Mapping

SONAR equipment are being used for the collection of bathymetric details (depth profiling and benthic habitat mapping).

Keywords: Data-Loggers, Equipment-design, PAM, SONAR.

Project Title	:	Development of conservation action plan for river dolphins; *Platanista gangetica gangetica*
Principal Investigator(s)	:	Prof. Qamar Qureshi, Dr. S.A. Hussain
Researcher(s)	:	Sajal Sharma (Project Fellow)
Funding Agency	:	CAMPA
Project Duration	:	2016 – 2021

Habitat assessment of River Subansiri, Assam with reference to plankton: A preliminary study

-Anumitra Phukon

Planktons are sensitive to environmental changes in the aquatic habitat. Being at the base of aquatic trophic level, planktons can be a reliable indicator of determining river health.

The aim of the study was to get an overview of plankton communities in Subansiri River, one of the relatively undisturbed habitats of Gangetic dolphins (*Platanista gangetica gangetica*). The 99 km long Subansiri River (within the state of Assam) was divided into 4 sectors for the dolphin study and planktons were sampled in each of these sectors. Samples were collected by filtering 100 L of water through a plankton net (mesh size = 60 micron), filtrate remaining in the collecting tube were collected in sample collection bottle with addition of 4-10% formaldehyde solution. Drop count method was used for counting planktons under 10-40X eyepieces of an inverted microscope and planktons were identified using standard manuals.

Fourty three genera of phytoplankton and 16 genera of zooplankton were identified so far. Plankton density was recorded 33.95 (SD=9.73) phytoplankton/L and 5.04 (SD=2.08) zooplanktons/L. To understand the anthropogenic disturbance factors influencing species composition, Non-metric multidimensional scaling (NMDS) in BiodiversityR was performed. The anthropogenic variables considered were distance from dam site and presence/absence of ferry ghat. NMDS showed that the plankton composition varied with increasing distance (<20 km, 20-50 km and >50 km) from the dam site (dim=4, permutation= 500, stress value=0.16). To test the relationship between plankton richness and water quality parameters (Ammonium, pH, temperature, DO, TDS) correlation test was performed. No significant correlation was observed between phytoplankton richness and water quality parameters. While a correlation was observed between zooplankton richness and ammonium (r= -0.52), but not significant with TDS (r= -0.15), DO(r= -0.19), pH (r= -0.38) and Conductivity (r= 0.06).

Species from 8 genera of Phytoplanktons and 4 genera of Zooplanktons recorded in this study are indicator of environmental conditions like pollution and Eutrophication. So, further monitoring of these indicator species could be a bridge to assess the health of the river and higher trophic level biota.

Keywords: Aquatic habitat, Aquatic pollution indicators, Drop count method, NMDS.

Preliminary assessment of parasitic richness in select ungulates of Keibul Lamjao National Park, Manipur

-Dr. Manoharmayum Vikramjit Sharma

Sangai and hog deer are listed as endangered in the IUCN Red list and fall under Schedule I of the Wildlife Protection Act, 1972, and share the habitat with domestic livestock. The species is susceptible to small population paradigm that renders populations vulnerable to stochastic events with disease posing a potential threat. Sangai are particularly susceptible to disease being an inbred population placed in juxtaposition with domestic livestock with the likelihood of the diseases causing catastrophic decline. The study was undertaken with the objective of assessing the gastrointestinal parasitic species richness in the two cervid species inhabiting the area.

The study was conducted in Keibul Lamjao National Park (KLNP) with an area of 40km² that is home to the last surviving population of Manipur's brow-antlered deer or Sangai, which inhibits approximately 15 km² of the park. It is located in the Barak-Chinwin-Irrawady basin between 24°26' N and 24°31' N latitude and 93°49' E and 93°52' E longitudes and surrounded by human dominated landscape.

Dung pellets of Sangai and hog deer (n = 50) were collected and subjected to coprological examination to assess the parasitic richness and load using sedimentation, flotation and Mc Master technique.

The parasitic diversity recorded among Sangai and hog deer included Amphistomes, Strongyle sp., *Strongyloides* sp. with *Trichuris* sp. additionally present in Sangai. The overall prevalence of parasites in Sangai and hog deer were 92% and 100% with the samples having one or more parasites with variable parasitic load.

The study demonstrates high prevalence of parasites in the Sangai and hog Deer and shows similarities with the reported parasites of livestock. A detailed systematic study with robust sampling protocol, including a study of interactions with livestock is required to understand the potential impacts of parasites on the long term survival of the species.

Keywords: Gastrointestinal parasites, , disease, livestock interactions, Sangai, Hog deer

Socio-economic status of the fishing community around the Pumlen lake

-Akoijam Santikumar Singh, Anjali Achom

The Pumlen Lake (PL) and Thongam Mondum Reserve Forest (TMRF) area is being proposed as a second home for Sangai (*Rucervus eldii eldii*) and a Conservation Reserve for conserving the species and promoting sustainable development. With this perspective, the present study aims to carry out the socio-economic assessment of the villages surrounding PL and TMRF for formulating future conservation planning with community participation in the area.

The study was carried out during 2017-2018 in eight fringe villages of PL and TMRF, Manipur.

Both primary (household questionnaire survey) and secondary data (census report from Anganwadi centres) were collected using mixed methods. Descriptive statistics was used to analyze the data.

The villages are inhabited by Meetei/Meitei community. A total of 149 households were surveyed covering 45.15% of the total population having an average household size of 6.4 persons/household. 38% were illiterate and 62% were literate; of which, 46.2% were female and 53.8% were male. Most of the households (92%) used fuelwood as primary source of energy. The average total land holding size is 0.78 hectares per household. More than 70% of the households earned less than INR 1 lakh per annum. About 31.5% of the households have livestock. Fishing (36.5%) and pisciculture (35.15%) were the major source of livelihoods followed by agriculture (10.92%) and vegetable collection (8.53%). The results showed high level of dependency with 92.6% households being dependent on resources including fishes, vegetables, fuelwoods and fodder grasses which are used for both domestic and commercial purposes.

The people in the area have low economic status due to lack of high earning livelihood options combined with low literacy rate and poor village infrastructure. The present resource utilization pattern could have negative impact on the lake and its resources in the near future. This baseline information will be helpful for developing strategies to improve living standards of the local community and assuring sustainable use of natural resources. Further extensive survey of the remaining fringe villages is recommended to have more robust information.

Keywords: Sustainable development, conservation planning, livelihoods, dependency

Species identification using molecular techniques revealed misidentification of fecal pellets based on pellet morphology

-Mirza Ghazanfar Ullah Ghazi

Identifying species inhabiting an area is crucial for ecological and conservation based studies. India has a rich ungulate community with multiple species co-occurring in the same landscape. Identifying species based on the morphology of the fecal pellet is a challenging task. Several factors are responsible for shaping the morphology of the pellet at the given seasons and locations. Misassignment of species may negatively affect the conservation planning of the particular species.

Our study aims to estimate the misidentification of species based on the morphological characters of the fecal pellets using DNA based species identification. The study was conducted in the Keibul-Lamjao National Park (40 km^2), situated in the southern fringes of the Loktak Lake in the state of Manipur.

Fresh fecal pellet samples (n=80) were collected from the study site and 50 specimens labelled as *Rucervus eldii eldii* (Sangai) were analyzed for the study. The pellets were swabbed using cotton swabs and stored in vials containing absolute ethanol. Total genomic DNA was extracted from the fecal swabs with Stool DNA isolation kit (Qiagen, Germany). A relatively conserved region of the mitochondrial cytochrome *b* gene (400 bp) was selected for the identification assay because of its utility in species identification studies.

The species identification was carried out using nucleotide BLAST function of NCBI. Out of 50 samples, 45 showed identical nucleotide composition to *Rucervus eldii* deer sequences and 5 samples were observed to be of *Axis porcinus* origin. DNA based species identification revealed that 10% of the total samples were misidentified during the collection surveys.

This misidentification might result in high error rates in the dietary studies of ungulates. Therefore, species assignment need to be tested using molecular tools prior to any ecological study to minimize the chances of bias and accurately assigning them to the ungulate species that produced them.

Keywords: Fecal pellet, identification, ungulate, morphology, *Rucervus eldii eldii*

Spatial Utilization of Manipur Brow-antlered deer and Hog deer in Keibul Lamjao National Park (KLNP), Manipur

-Sijagurumayum Rohikanta Sharma

Competition for resources is an ecological process for co-existing species. With limited space available inside KLNP, there is a need to define the area utilized by the two species of cervids, viz., Manipur's brow-antlered deer or Sangai and Hog deer, and the extent of their spatial overlap.

The study was carried out in Keibul Lamjao National Park (KLNP) located in south-eastern part of Loktak Lake. The Park with an area of 40 km^2 is the last remaining natural home for Sangai.

Strip transects of 2 m width and 500 m length were monitored for the presence of pellets of Sangai and Hog deer. All observations were recorded using a GPS device. On these transects, the thickness of *phumdi* were measured at an interval of 50 m. Mean pellet density was calculated from 598 strip transects during 2016-2018.

Based on occurrence of pellets, 83.3% spatial overlap was found between Sangai and Hog deer with the former largely utilizing the northern zone, whereas, Hog deer utilizing most of the Park's area. No significant difference was found in spatial segregation between these two species. Pellet density (per km^2) for Sangai was found to be 17.84±3.29 in high, followed by 8.24±3.88 in medium and 3.55±0.71 in low pellet distribution areas respectively. Whereas, for Hog deer, it showed high pellet density of 70.08±9.41, followed by 27.94±4.51 in medium and 14.91±5.09 in low pellet distribution area respectively.

The large extent of overlap between the two species of cervids can be attributed to the extensive spatial utilization of the thick *phumdi* areas of the Park. Change in usage pattern of Sangai can be related to the changing habitat composition. There is a need to keep updating the spatial usage pattern for the two cervids and implement proper management interventions. Further research is required to understand other variables, apart from *phumdi* thickness that influence species distribution.

Keywords: North-east India, Barak-Chindwin River basin, space use, Sangai, *phumdi*

Status of Dugongs and seagrasses in the Gulf of Kachchh, South West

-Sameeha Pathan

In the Gulf of Kachchh, Gujarat, a relict population of the dugongs or sea cows still exists. The unique topography of the offshore Patch reefs and intertidal zones of the islands create opportunities for pioneering seagrass species to establish which becomes important grazing areas of marine mega herbivores like the green sea turtles and dugongs. A 5-year long absence in the data regarding dugong sightings or strandings lead to the premature speculation that small population might have diminished.

The south western part of the Gulf of Kachchh was focused during the study. Two offshore islands, Beyt Dwarka and Ajad and one offshore Patch reef, the intertidal of which were surveyed extensively for seagrass and intertidal mapping

Based on the previous dugong sightings information. we focused on seagrass mapping via random quadrats, meadow perimeter walks through a grid-based approach to assess the seagrass composition and cover in each site of the south-western GOK.

We report meadows of *Halophila. beccarii* in Ajad island, *Halophila ovalis* in Beyt and *Halophila ovalis- Halodule uninervis-Halodule wrightii* mixed meadow in the south western part of the Pagar reef, all thriving in muddy substratum, which gives hope of finding potential dugong grazing areas in mud flats which covers an area of approximately 1260 sq. km, compared to the 68 sq. km of sandy area, the conventional seagrass substratum. Meadow composition is found to be influenced by sediment type and exposure during the low tides. Monospecific seagrass meadows of *Halophila beccarii* and *Halophila ovalis* in Ajad island and Beyt island respectively, were not found to be heavily biofouled by epiphytes. Conversely, multispecific meadow of *Halophila ovalis- Halodule uninervis-Halodule wrightii* on the Pagar patch reef is found to harbour a higher percentage of epiphytes on their lamina.

Enhanced community participation in dugong conservation awareness activities helped us to locate two dugongs strandings within a period of 6 months. Photo documentation, standardized necropsy procedures and stomach content analysis done for both the carcasses has brought to light several indispensable information, from net entanglement, life history, feeding biology, potential grazing areas, and marine debris.

Keywords: Gulf of Kachchh, seagrass, dugongs, mapping, necropsy.

Uncharismatic habitats: studying seagrass ecosystems in a coral-centric marine world

-Swapnali Gole

Seagrass habitats are understudied important ecosystems as compared to other coastal habitats like corals and mangroves. The Andaman and Nicobar Islands harbor 12 species of seagrass habitats which are consistently exposed to natural and anthropogenic pressures. Adding to this, long-term monitoring of seagrass habitats is essential for conservation of threatened species like dugongs, as India holds the last remaining populations of Dugongs in the Indian sub-continent.Thus, the focus of the present study was to understand the species distribution and meadow characteristics of seagrasses with respect to the mega herbivore dugong.

We studied the seagrass distribution across 5 islands in Ritchie's archipelago in the Andaman Islands. Intensive Line Intercept Technique surveys (n = 32, comprising 352 quadrates) through SCUBA-diving were conducted to understand seagrass species composition, density, habitat complexity and associated macrofauna. We also assessed dugong distribution in these areas through a stakeholder involved participatory approach for delineating significant seagrass areas.

The total seagrass cover was 21.60% contributed by eight species belonging to four genera. A wide depth range (1 to 21 meters) and spatial niche partitioning was observed where late successional species (_Thalassia_ sp., _Cymodocea_ sp.) occupied shallow intertidal waters whereas early successional species (_Halophila_ sp., _Halodule_ sp.) preferred by dugongs occupied deeper waters. The highest biomass (dry weight) was recorded for _Cymodocea_ _serrulata_ (4.61±4.48) whereas the lowest was for _Halophila_ _minor_ (0.16±0.08). _Thalassia_ _hemprichii_ (4.84±2.50) and _Halodule_ _uninervis_ (0.57±0.81) had the highest and lowest canopy heights respectively.

Species preferred by dugongs _Halodule uninervis_ (156.00±89.38 /m^2) and _Halophila ovalis_ (143.52±70.24 /m^2) had the highest shoot density. Seagrass cover was affected by the substratum whereas depth affected the biomass. Annelids and (2.08%) and cnidarians (1.09%) contributed maximally to the macro benthic diversity.

Our participatory approach to understand seagrass and dugong distribution resulted in identification of critical seagrass areas for long-term monitoring at all the three sites. In this study, we highlight the importance of continued monitoring of seagrass areas in the wake of rapid coastal development in the country, and declining dugong populations.

Keywords: Habitat importance, succession, dugong distribution

Abundance and distribution of Ganges River Dolphin (*Platanista gangetica gangetica*) in Brahmaputra River System

-Ashwin Warudkar and Sunny Deori

Ganges River Dolphin *Platanista gangetica gangetica* is an endangered freshwater dolphin species found in the Ganges and Brahmaputra river systems in India. In the face of substantial decline in its distribution range as well as suspected decrease in population, there is an urgent need for monitoring its population trend. The present study aims to estimate the Ganges River Dolphin population in Brahmaputra River System to establish a current baseline.

A river stretch of 884 km of Brahmaputra River, 93 km stretch of Subansiri River, 69 km stretch of Kulsi River and 65 km stretch of Nakhanda River was surveyed in 2018. Double observer based capture-recapture method was followed in Brahmaputra and Subansiri River survey, whereas single observer based direct count method with towed Acoustic Tag (A-tag) was followed in Kulsi and Nakhanda river to obtain least count. Acoustic detections using A-tag were used to overcome availability bias. Investigations were conducted to understand the upstream distribution of dolphins in 16 tributaries of Brahmaputra through questioner based survey among local river side communities.

Dolphin survey resulted into an abundance estimate of 877 ± 19 dolphins in Brahmaputra River and 48 ± 6 dolphins in Subansiri River. Highest dolphin count was recorded in the Brahmaputra stretch adjacent to Kaziranga National Park (6th edtion). A least count of 37 dolphins was recorded in Kulsi River and 30 dolphins in Nakhanda River. Perennial dolphin presence was recorded in Subansiri and Kulsi River, whereas further investigation is required for the dolphin population of Nakhanda Rivers. Dolphin presence was recorded in eleven out of 16 tributaries of Brahmaputra during monsoon season.

Higher dolphin abundance in the part of Kaziranga NP, suggests that protected areas for terrestrial mammals also aid in conservation of aquatic ecosystems. Occurrence of newly born calves in rivers Kulsi and Nakhanda suggests their breeding in these small rivers. With the current reasonably robust baseline, we shall be able to monitor population trends and determine conservation needs for river dolphins in River Brahmaputra.

Keywords: A-tag, Double observer sampling, Mark-Recapture, Population monitoring

Assessment of fish fauna associated with sub-tidal seagrass meadows of Andaman and Nicobar Islands- a case study

-Sohini Dudhat

Fishes are known to use seagrass meadows as nurseries, foraging grounds and as a refuge from predators. In the current study, we aimed to quantify fish species' populations at sub-tidal habitats with an objective to understand the influence of seagrass meadow characteristics.

The present study was conducted at the 'Richie's Archipelago' which is the eastern part of Andaman and Nicobar islands, which comprises of mono as well as multi-specific seagrass meadows.

Surveys were conducted by SCUBA diving at seagrass meadows employing two methods - belt transects and point counts with fixed radius. Line intercept transects were conducted at the same locations to understand the seagrass ecological parameters.

Seagrass habitat was heterogeneous in nature comprising of sand, rocks and live corals, which might determine resource availability for a wide variety of fishes. Fifty-nine species of fishes were identified belonging to 18 different families (family Gobiidae (47.98%), family Pomacentridae (19.5%), family Labridae(8.3%)). The fishes were categorised according to habitat guilds (bottom dwelling (n=18), coral and anemone associated species (n=37) and seagrass associated species (n=7)) and feeding habits (herbivores (n=20), carnivores (n=30) and omnivores(n=9)). We observed that the seagrass patches in Ritchie's archipelago were patchy and interspersed with coral reefs and other habitat features (mean % cover: sand= 89.94%, 3.51% rock, 2.34% rubble, 1.90%live coral and 1.76% sand-rubble,). Fish density did not differ between belt transect and point counts (T-statistic = 0.745837, p >0.05) and showed no strong relationship with seagrass height, cover or with depth.

We assume that the densities of fishes are low due to patchy and sparse nature of seagrass meadows in Ritchie's Archipelago. In the future, we recommend observational sampling of fishes to understand their habitat use and herbivory at selected long-term monitored seagrass sites in the islands.

Keywords: Island ecosystems, belt transect, point count, seagrass associated fauna.

Characterization of shipping noise with respect to the acoustic habitat of River dolphin

-Gargi Roy Chowdhury

The Endangered (IUCN), Ganges river dolphins are functionally blind and relies almost exclusively on sound as the primary sensory mode. The CAMPA- Dolphin project seeks to understand the key threats for dolphins and their habitat. Acoustic pollution from ship noise has the potential to affect its habitat quality by interfering with the ability to detect important signals such as echolocation and communication.

Kolkata and Haldia on the lower Hooghly river are major ports and experience high volumes of commercial ship traffic. Lower Hooghly is a major habitat of Ganges river dolphin. The Irrawaddy river dolphin (Endangered) has also been recorded by us. We deployed cabled hydrophone in six locations in the lower Hooghly River of West Bengal during the months of June-August 2018. Nearly 200 recordings (time range: 1 min-20 min) were made for characterization of shipping traffic and the ambient environment. Characteristics of commercial ships were mined from online ship tracking resources. The median gross tonnage of the recorded vessels is 6190 t (range: 1221t-14195t).

Acoustic data were analyzed using *seewave* and *PAMGuide* software in the R environment. Broadband sound source level was estimated taking transmission loss into account using the sonar equation. The absolute Sound pressure level of vessels was high (203.56 $\pm$5.94 dB re 1μ Pa @ 1 m). From 1/3 octave level analysis, it was found that most of the noise is in lower frequency bands. However, overlap in higher frequency bands that are used by dolphins (61.4 $\pm$ 4.9 kHz) is also observed. For 50-80 kHz the sound pressure level of vessels ranges from 81-102 dB re 1 μ Pa.

Relationship of river dolphins and shipping traffic with the tidal cycle is discussed. Work on behavioral responses of dolphins to shipping noise is in progress. The Ganga is also a National Waterway, plans to increase cargo transport through the river up to 1600 Km upstream are well advanced. Continued efforts in the direction of this study has direct relevance in understanding the impact and mitigation.

Keywords: Gangetic river dolphin, Underwater noise pollution, Echolocation, Commercial shipping, Tidal cycle

Project Title	: Development of conservation action plan for river dolphins: *Platanista gangetica gangetica*
Principal Investigator(s)	: Prof. Qamar Qureshi, Dr. S.A. Hussain, Dr. Vishnupriya Kolipakam
Researcher(s)	: Scientist: Wakid A, Rashid, R, Shovna R, Fellows: Anumitra P, Ashwin W, Gargi RC, Kanad R, Leela P, Merin J, Naman G, Rajat R, Sunny D, Genetics: Srinavas Y GIS: Priyamvada B, Prj Assistant : Ajay G, Assoc-EcoTox: Vineet S
Funding Agency	: CAMPA-Dolphin
Project Duration	: 2016-2021

Phylogeography and Population Genetics of Great Indian Bustard and Dugong

-Srinivas Yellapu

Species which exists in low population sizes and isolated are more prone to loss of genetic variation in long term due to inbreeding. Gaining insights into molecular information on genetic diversities and population genetic structure are therefore crucial in better understanding of the species to manage for a long term conservation. Great Indian Bustard (GIB) and Dugong are endangered species with low population sizes (n<=200) in the Indian subcontinent. Despite considerable conservation efforts for their population recovery, no significant information on their genetic diversity is available till date. This study aims to understand the current status of genetic variation and population genetic structure, for both species.

Biological samples in the form of egg shells, tissue, feather, faeces (for GIB), and museum bones and tissue (for dugong) were collected. GIB sampling was carried out from Gujarat, Rajasthan, Maharashtra, Madhya Pradesh and Andhra Pradesh whereas Dugong sampling was from the Gulf of Kachchh, Gulf of Mannar, Palk bay and Andamans.

Genetic data was generated from the mitochondrial control region and cytochrome b, and from nuclear regions using microsatellites. GIB showed low genetic diversity with both mtDNA and microsatellites. Three mtDNA haplotypes were identified across all sampled areas. Bayesian clustering structure analyses indicated three genetic clusters, with majority of the variation observed in Rajasthan population (Ho, 0.34) followed by Gujarat (Ho, 0.29).

Dugongs mtDNA analyses revealed six unique haplotypes from India with one haplotype shared among all Indian populations. The haplotype diversity (0.758) was comparable to existing dugong populations from Australia and Thailand, whereas nucleotide diversity (0.005) was low. The sampled populations show various levels of genetic differentiation among themselves.

Rajasthan retains the largest and most genetically diverse GIB population and should be the main choice to select founder population for conservation breeding program.

Indian and Mauritius dugongs are genetically closer to the Australian lineages. Given the declining population trends of Indian dugong and extinction of the species from Mauritius, conservation of the remaining population is critical. The Australian populations that are genetically closer could potentially be used for reintroduction/supplementation.

Keywords: Non-invasive, genetic diversity, conservation breeding, founder, reintroduction.

Dugongs, Seagrasses and the Community: studies on parts of the Tamil Nadu coastline

-Rukmini Shekar and Madhu Magesh

The largest Indian population of Dugongs (*Dugong dugon*, Müller), the only completely marine herbivorous mammal thrives on seagrass meadows of Tamil Nadu. Threats such as hunting for meat and seagrass habitat degradation are major reasons for dwindling dugong numbers. Hence, this study was conducted for an integrated participatory approach towards dugong conservation.

We worked in areas with reportedly high dugong occurrence in Palk Bay and northern Gulf of Mannar Marine National Park.

We surveyed for seagrass meadow characteristics using line intercept transect method while snorkeling/SCUBA diving. We assessed ecosystem services of seagrasses by conducting questionnaire surveys among fishing communities across the region and estimating major fisheries produce.

The highest seagrass cover was observed in North Palk Bay (88.5% cover), where a maximum of 7 species occur, and the least in Central Palk Bay (38.53% cover) where corals thrive. Seagrass associated macrofaunal occurrence was least in North Palk Bay (19% of total occurrence in study area) and the highest in Central Palk Bay (28% of total occurrence in study area). The catch per unit effort, an indicator of fisheries was highest in South Palk Bay (153.8354) where seagrasses are patchy, when compared to other parts of Palk Bay (North: 119.0892 and Central: 138.5417); probably due to high number of trawlers operating in this region, which is also a zone of overlap between seagrass and coral ecosystems.

We established a 'Friends of Dugong' network consisting of 100 fishermen who report dugong sightings and deaths. Four entangled dugongs were rescued (2 adults, and 1 adult with her calf) by fishermen and can be considered a remarkable outcome of our outreach.

As Palk Bay has no Protected Area, the docility and near-shore feeding habit of Dugongs expose them to coastal anthropogenic threats. Hence, it is essential to assess their distribution, status and health of their habitats and the factors negatively affecting them. We are working towards a marine spatial planning approach to gather scientific data on dugong occurrence and seagrass health of the region with an integrated approach for community-backed conservation.

Keywords: Dugong, Seagrass, Palk Bay, Gulf of Mannar, Fishermen, Associated macrofauna, Outreach

Lesser needs greater attention: status assessment and conservation challenges of Lesser Florican across breeding range

-Sujit Narwade

Lesser Florican *(Sypheotides indicus)* is an endangered agro-grassland bird whose ecology and status are poorly known. This has proved to be an impediment in its conservation efforts. A national status survey was implemented under the Bustard Recovery Program with Bombay Natural History Society, The Corbett Foundation and State Forest Departments as partners.

We conducted surveys at the scale of breeding range and eco-geographically defined regions and landscapes (Ajmer: Shokaliya-Kekri; Rest of Rajasthan: Shahpura, Jalore, Pratapgarh; Gujarat: Kutch, Saurashtra; Madhya Pradesh: Ratlam, Jhabua, Dhar; Maharashtra: Akola-Washim).

Florican's breeding range was delineated using informed digitization, MaxEnt distribution model, and inputs from local experts. Species' status was assessed based on displaying males during July-September 2017-18, using spatially representative sampling, where we: a) estimated the species' occupancy in 36 sq km cells (sites) using vehicle observation points, and b) species' abundance at detected sites using line transect distance sampling. c) We developed statistical relationships between occupancy/density and field-collected habitat covariates (land cover, vegetation structure and anthropogenic pressures) & d) to generate conservation priority map. The survey was conducted with a team of 121 observers, who were trained through state-level workshops.

Florican occupancy was assessed at 428 sites (~20,000 sq km range), using 5564 stop-overs, and density was assessed in 32 occupied sites using 479 km transect-walks that yielded 70 sightings. Florican occupied 13(3SE) % sites or 1908 sq km area at a density of 0.25(0.06SE) males/sq km. Population size was estimated to be **340 (162–597 95%CI) males**, largely restricted to: Velavadar, Gujarat (96–115) and Shokaliya-Bhinai, Rajasthan (110–136). The species' occupancy was plastic, favored by grassland cover in Gujarat, and agricultural cover in Ajmer. However, the area required to conserve the species is one order greater in agricultural landscape than grasslands.

Our key recommendations for priority sites are to: a) protecting priority sites identified by us, b) regulating intensive land use change through policy and incentives, c) implementing scientific grassland management; d) consolidating networks of local people, e) understanding non-breeding ecology and usage using satellite telemetry; and f) advocacy and outreach to garner conservation support.

Tracks on the sands of time: Long-term ecological monitoring of Thar

-Bipin C. M.

Great Indian Bustard (GIB) is a Critically Endangered and Schedule I species with less than 150 individuals left, almost exclusively in India. Based on the National bustard recovery plans, Wildlife Institute of India commenced a GIB recovery project in partnership with State Forest Departments and NGOs. The project aims are: (a) develop conservation breeding program; (b) applied research; (c) outreach; and (d) pilot habitat management. The largest population of GIB is found in Thar landscape in western Rajasthan, but information on recent trends of this population, status of associated species (chinkara and desert fox), habitat characteristics, and threats are scanty.

This study assessed the population status and trend of, GIB and associated native and non-native (free-ranging dog, pig and nilgai) species along with the habitat status and anthropogenic pressures across 19,728 km^2 of potential bustard habitat in Thar landscape from 2014-18. The landscape is situated in Desert- Thar (3A) biogeographic zone and encompasses parts of Jaisalmer, Jodhpur, Bikaner and Barmer districts. Systematic surveys were conducted in 144 km^2 cells from slow-moving vehicles along transects. Teams comprising field biologists and Forest Department staff simultaneously sampled ~4000 km transects. GIB and associated species detection data were analyzed in Occupancy and Distance Sampling framework to estimate proportion of sites occupied and abundance.

GIB and desert fox showed declining trend in abundance. Chinkara showed fluctuating trend in abundance but decreasing trend in occupancy over the years. The recent abundance estimates are 128(19SE) GIB, 40442(2810SE) chinkara and 2965(471SE) desert fox. Our surveys showed anthropogenic expansion across survey years, wherein the proportion of sampling plots (500m) with water source, power-lines, farm-huts and wind turbines increased annually by 0.12, 0.09, 0.07, and 0.03 respectively. Trend of power-line intensity was higher in GIB extinct cells compared to occupied cells. Population status of non-native species (dogs and pigs) increased over the years.

To recover GIB population by restoring habitats in this landscape, we recommend; mitigating detrimental effects of power-lines; active management of free-ranging dogs, pigs and native nest predators; and consolidate and manage existing breeding enclosures and priority conservation cells across proposed Eco-Sensitive Zone.

Keywords: Great Indian Bustard, Population trends, Power-lines, Free-ranging dogs, Eco-Sensitive Zone

Hidden costs of green energy: bird mortality due to expanding power-line network in Thar desert

-Mohib Uddin

Powerlines are a global problem for bird conservation, but their impacts are poorly studied in tropical developing countries like India. Under bustard recovery program, we assessed bird mortality due to power line collision/electrocution

The study was carried out in Thar landscape of Rajasthan - a renewable energy hotspot. This landscape is a prime habitat for the critically endangered -Great Indian Bustard. Thar is the Eastern extension of the vast Iranian-Arabian Desert, which joins the great Sahara Desert. It is about 640 km long and 160 km wide.

To assess bird collision rates, 40, 2 km powerline segments (20 high- and 20 low-tension) were selected and 60-m belt were sampled for bird carcasses from March to December 2017 for 6 times, covering all seasons. Powerlines were cleared of carcasses one month prior to sampling. Experiments to correct carcass encounter-rates for detection and decomposition biases were conducted.

Mean monthly carcass encounter rate for small (<100g), medium (100-1000g) and large (>1000g) birds were 0.25, 0.22 and 0.22 individuals/km for high-tension lines, and 0.04, 0.15 and 0.05 individuals/km for low-tension lines, against negligible mortality in random belt-transects without powerlines (control). Carcass detection probability was low for small birds (0.43) compared to medium (0.84) and large (0.97) birds. Carcass persistence probability was less for small (0.08) and medium birds (0.16) compared to large birds (0.48). Correcting for these biases, actual collision rate was estimated at 7.74 (SE=0.87) small, 1.70 (0.14) medium and 0.47 (0.06) large birds $km^{-1}\,month^{-1}$, yielding an estimated **8,013 bird mortalities/month** in the 4,200 sqkm area. Two GIB carcasses were found during surveys and two outside of it, yielding an estimated mortality of **~18 GIB/year** in Thar.

Thus, powerlines act as a significant threat to birds, affecting >30 species in Thar, and is the most critical current threat for bustards. Since these powerlines are linked to wind turbines, we reveal hidden ecological costs of renewable energy. We mapped powerlines and identified risky segments that were disseminated to power agencies for mitigation measures such as marking powerlines with diverters or building underground network of powerlines in certain areas. These mitigation measures need to be scaled up across wildlife habitats.

Keywords: Bird diverters, decomposition bias, Great Indian Bustard, transmission lines, undergrounding

Friend turned foe: impacts of free-ranging dogs on livelihoods and native fauna of an arid ecosystem

-Devendradutta Pandey

Dog (*Canis familiaris*) is an introduced predator with a near-global distribution that is responsible for extinction of 11 vertebrates and is a threat to 188 globally threatened species. Free-ranging dogs survive on their own, tend to kill livestock, go through garbage bins in urban, semi urban or rural areas and even hunt wildlife, facilitating disease transmissions and threatening wildlife.

The study was conducted in the Thar landscape of Rajasthan.This landscape is a prime habitat for the critically endangered-Great Indian Bustard. The study area includes Desert national park, tourism zone comprising of resort camps, wilderness and traditional agro-pastoral area, covering 1008 sqkm.

As part of the Bustard Recovery Program, we estimated population size, behavioral activity, ranging patterns and predation rate of dogs. The study was conducted from December 2016 to March 2018.Dog population was estimated by a double sampling approach, where crude counts of dogs were calibrated with mark-recapture based abundance and landscape-scale dog abundance using vehicle transect based distance sampling. Commercial vehicle tracking satellite tags (make: SPOT Trace) along with VHF radio collars were placed on 7 individuals for behavioral observation, ranging pattern and predation rate. Home ranges were estimated using Minimum Convex Polygons.

Radio-tracking showed that free-ranging dogs range across 19.8 sqkm and predate 22 (7.6 SE) chinkara/dog/year, equivalent to 33% population offtake. Population assessment indicated 408 (27.23 SE) dogs in 6 settlements in/around prime GIB habitat in Desert National Park. Ancillary questionnaires showed that 70.25% villagers had suffered economic losses due to livestock depradation and 83.3% villagers were attacked by dogs.

Our study highlights significant livelihood and conservation hazards of free-ranging dogs. It shows excessive predation of chinkara, which is the probable reason behind its declining occupancy over years. There can be potential negative impact on the critically endangered GIB as well. There is urgent need of implementing holistic dog population control measures that includes sterilization and targeted removals. We plan to conduct dog sterilization in Thar and Kutch with the help of NGO partners

Keywords: *Canis familaris*, double sampling, activity pattern, home range, predation rate

Hearing unheard voices and the incubation of a breeding center: milestones achieved in outreach and ex-situ components of bustard recovery program

-Tanya Gupta and Tushna Karkaria

Working with people is essential to create buy-in and goodwill for the long-term success of both in-situ and ex-situ conservation efforts for the Great Indian Bustard. This research aims at engaging with the people who live in and around the Desert National Park where a significant portion of the last remaining GIB populations reside. Here we present our outreach activities and findings of the questionnaires conducted in GIB landscape of Thar, Rajasthan. We also present the activities undertaken to establish a conservation breeding project for the bustards.

The study was conducted in the GIB Landscape in Thar Jaisalmer. Questionnaire survey was conducted in twenty villages and 10 Dhanis. The sites for the conservation breeding centres were chosen in Sorsan of Baran district and Ramdeora of Jaisalmer district. The sites were selected after conducting multiple surveys of potential sites around the Thar Landscape.

We carried out stakeholder (Army and power agency) sensitization meetings/workshops. We designed questionnaires following equi- proportional sampling and surveyed 158 households across 20 villages and 10 Dhanis. Questions regarding local livelihood concerns, conservation perceptions, scope of alternate livelihoods, and ways to minimize local antagonism towards conservation were asked, which would help in designing public outreach programs.

Stakeholder sensitization resulted in pilot installation of bird diverters procured by us, and access to the Pokhran Field Firing Range for conservation efforts. Questionnaires yielded information on the access and utilization of different provisioning ecosystem services, variety of agricultural products and their production in an individual household. We also acquired information on the problem of free ranging dogs and wild pigs in the target area along with the spectrum of additional problems, which local people are facing. We also found that approximately 64% of households in the study area rely on wage labour and the severity of problems faced by local people in an individual household was higher inside Park than outside Park. However, people's problems were not limited to problems related to Park, leaving scope for conservation reconciliation.

For ex-situ efforts, a MoA has been signed between MOEFCC, Rajasthan government and WII to implement conservation breeding activities. The land has been selected in Sorsan for breeding center and in Ramdevra for satellite center, and its allocation for building these facilities is in the process. The staff visited successful breeding centers in India and Abu Dhabi. Collaboration with International Fund for Houbara Conservation for training and technical support is being formalized. In future, we plan to scale up outreach activities cutting across stakeholder groups, and to expedite the design and construction of the facility and training of staff in implementation.

Keywords: Conservation breeding, sensitization, training, Thar, questionnaires

Understanding the dynamics of two major threats to Ganges river Dolphin in Brahmaputra

-N Leela Prasad

Of the numerous anthropogenic threats faced by the Ganges river dolphin, oil-bait fishing using dolphin oil is a major threat. With increasing developmental activities in rivers, vessel noise and other impacts owing to vessel movement is emerging as an additional threat in dolphin's habitat. As part of the Endangered Species Recovery Program, we attempted to characterize these threats and their current dynamics.

The study was conducted in parts of the Brahmaputra river of Assam.

For the first objective, semi-structured questionnaire surveys (n=82) were conducted with fishermen who are involved in the practice of oil-bait fishing in Assam. The fatty acid composition of Dolphin oil bait was also analysed for its composition to understand its role as a fish bait. For the second objective, vessel noise was characterized with approximate SPL(RMS) values from spherical spreading equation and 1/3 Octave level metrics for ferry boats in Guwahati. From 115 minutes of recorded data for ferry boats, ten best quality 10 second intervals were analysed. The metrics generated by these recordings were compared with ambient noise levels recorded in the absence of vessel movement.

Use of Dolphin as a bait is prevalent in 40 percent of respondents at present. The practice of oil-bait fishing is spreading according to the narratives of many fishermen due to the absence of sustainable employment options. Mean SPL level of ferry boats is 163.59 dB re 1 µPa when compared with the mean SPL of ambient noise of river at 119 dB re 1 µPa. 1/3 octaves showed an increased pressure output including 20 to 70 kHz frequencies which falls with in the River Dolphin's echolocating bandwidth.

Keywords: Ambient noise, bandwidth, Octaves, Oil-bait, Questionnaire, SPL, Vessel noise

People's perception about conservation of River Dolphin: Dialogue with stakeholder communities

-Shovana Ray

The present study was aimed at understanding the narratives and perception of the fishing communities about river dolphin. Extensive field work was executed at a 20 Km stretch along the Ganges at Farakka, West Bengal. Six villages adjacent to the river (three on either bank) were selected, based on a preliminary survey. Purposive and snowball sampling technique were followed to approach fishermen in villages and semi-structured interviews were conducted taking prior consent. A total of 158 fishermen were interviewed using a semi-structured questionnaire consisting of 32 items (demographic details, fishing methods, narratives). Interview data were collected in the questionnaire and necessary field notes were maintained for observational data. Descriptive analysis was done for demographic and fishing method data and content analysis was done for the narratives.

The fishing communities were found to be categorised on the basis of language, religion and caste system. overall there were two categories: traditional (Hindu caste based; 4 communities) and non-caste based (Muslim and Hindu other castes; 3 communities). River dolphin is a common species amongst fishing communities of Farakka; besides 11% of the fishermen, rest had personal experience of either seeing or touching it. Although it is perceived as a harmful species as it harmed the fishing net and fishes, if entangled in fishing net majority of the fishermen consider selling it for oil production. Considering dolphin oil to be a common household commodity with multiple uses of analgesic medicine and fish bait, there was no overt guilt among most of the interviewees . There were no specific beliefs or taboos prevailing in the communities, but few versions of folklores were retrieved from the community elders.

In spite of risk of under reporting of activities injurious to river dolphin, substantial proportion of respondents indicated utilising dolphin products (oil and meat). This indicates a high level of dolphin killing and lack of awareness among local fishermen. Widespread community engagement by concerned forest department can check on rampant killing of the species for production of oil.

Keywords: Dolphin oil, fishermen, narratives, semi-structured interviews

Project Title	: Development of conservation action plan for river dolphins; *Platanista gangetica gangetica*
Principal Investigator(s)	: Prof. Qamar Qureshi, Dr. S.A. Hussain
Researcher(s)	: Shovana Ray, Project Scientist
Funding Agency	: CAMPA
Project Duration	: 2016-2021

Release of Anthropogenic runoff into Riverine Ecosystem : The Ultimate Sink

-Ishi Narula, Vineet Singh

The unregulated release of effluents into the Dolphin habitat in rivers Ganga and Brahmaputra, calls for an integrated approach for assessing water quality in the river basin to study the accumulation of toxins in the biotic and abiotic components of the Riverine Ecosystem. The present study aims to evaluate the potential for using toxicity assays with river water, sediment and tissue samples for the detection of Heavy metal and OrganoChlorine Pesticides released by the discharge of industrial waste, sewage and agricultural runoff into water bodies and its application to further environmental investigation.

The physico-chemical characteristics and distribution of trace metals in the ecological elements (biotic and abiotic components) of the river Ganges in the north India and Brahmaputra in north east India were monitored. The core parameters as per the National Water Quality Monitoring Program such as pH, temperature, conductivity, dissolved oxygen, nitrate, chloride, heavy metals pesticides and pharmaceuticals personal care products (PPCPs) were studied. For essential water parameters YSI multiparameter instrument was used, Atomic Absorption Spectroscopy (AAS) for heavy metal analysis and Solid Phase Extraction (SPE) method for pesticides and PPCPs in water sample and QuEChERS method for sediment and fish tissue samples. Extracted samples was analysed by GC-ECD/NPD (Gas Chromatography – Electron Capture Detector/ Nitrogen Phosphorus Detector) and LC-MS/MS (Liquid Chromatography- Mass Spectrometer).

The study sites represented a clear and pronounced gradient of pollution, such as low dissolved oxygen concentrations (lowest being 0.02mg/l), high nutrient loads and significant toxic levels of heavy metals and pesticides concentration in fish tissues 4.019 ± 6.436 ng/kg around the effluent discharge site; thus putting the riverine ecosystem at considerable risk.

Keywords: Gangetic Dolphin, anthropogenic pollution, pesticides, heavy metals.

Project Title	: Development of conservation action plan for river dolphins; *Platanista gangetica gangetica*
Principal Investigator(s)	: Prof. Qamar Qureshi, Dr. S.A. Hussain
Researcher(s)	: Anumitra P, Ashwin W, Gargi RC, Kanad R, Leela P, Merin J, Naman G, Rajat R, Sunny D, Genetics: Srinavas Y GIS: Priyamvada B, Prj Assistant : Ajay G, Assoc-EcoTox: Vineet S
Funding Agency	: CAMPA
Project Duration	: 2016-2021

Mapping the habitat characteristics of Brahmaputra River and its relationship with river dolphin

-Merin Jacob, Rajat Rastogi, Priyamvada Bagaria

Ganges river dolphin (*Platanista gangetica gangetica)*is found in the Ganga, Brahmaputra, Meghna and Karnaphuli river system of India-Nepal and Bangladesh. To conserve such a range-restricted species, it is necessary to understand the habitat utilization pattern of the species. In this study, we investigated the habitat preference of Gangetic dolphin in 750 km stretch of Brahmaputra River within Assam.

We collected the habitat geomorphology and anthropogenic data during the visual and acoustic based dolphin surveys in Brahmaputra River in February, 2018. The study area was further divided *a posteriori*, into 30 sectors of 25 km stretch length each. Geomorphological characteristics of the survey channel of river Brahmaputra were then identified based on the data recorded during dolphin survey and the Land use land cover(LULC) map. Landsat 8 OLI images of April-May 2017 were used for mapping the LULC categories through visual interpretation technique. Data on water depth and number of fishing gears were added to each river sector using 'identity' tool in ArcMap 10.6.1.

The preliminary results showed that dolphin abundance might have a relationship with water depth of the surveyed channel(depth: 3-9m) proximity to the areas with counter current, and fishing intensity.A higher abundance of dolphins in and around protected areas was also observed.

The habitat preferences of dolphins in Brahmaputra River might be influenced by prey availability, eddy counter-currents (currents forming at confluences and meanders) and deep waters(depth: 3-9m).Further experiment can be designed for detailed investigations.

Keywords: Confluences, habitat preference, water depth.

Challenges in mapping the grassland habitats of highly endangered species of both marine and desert ecosystems

-Priyamvada Bagaria

Grasslands have been long been neglected as wastelands and do not appear as ecologically significant land cover categories in most atlases of national importance. Because of such neglect, the Great Indian Bustard (GIB) has suffered immense loss of habitat in the Thar Desert landscape (TDL). On the other hand, little is known of the expanses of the seagrass meadows in the Gulf of Kutch (GoK). Grassland and seagrass mapping is essential for the respective GIB and Dugong recovery programs, monitor the habitats.

The study area for grassland/savanna mapping was the TDL and the south western part of the GoK for seagrass mapping.

Classifying the TDL of about 30,000 Km^2 area using conventional methods of satellite image classification (supervised and unsupervised classification methods) proved to be labour and time intensive, and relatively inaccurate. A statistical approach towards spectral index based image segmentation was also tested, followed by a machine learning approach using random forest classifier on the principle components of the spectral indices. In case of the seagrass meadows of GoK, a bottom index based MAXENT modelling approach was used on the pan-sharpened landsat image for identification of potential seagrass locations in intertidal zones.

For classification of grasslands in the TDL, the best overall accuracy (69.5%) was achieved with the use of random forest classifier, as compared to that of the conventional methods (56%). The classified image of TDL shows the grasslands span over about 9338 km^2 in area, with concentrations in enclosures and firing ranges. In the GoK regoin, the ground verification of the modelled seagrass locations revealed spectral mixing between algal cover and seagrass cover. The spectral responses from the intertidal zones of GoK are an amalgamation of the sediment, algae, scanty seagrass and water back-scattering. A change in the course of methodology was adopted in which, a gridded (50m) multi-parameter modelling approach is being tested now.

Both random forest and MAXENT models are examples of machine learning approaches. In a ground data efficient scenario the model performed well, while it failed in a spectral information deficient study area.

Keywords: Remote sensing, machine learning, landsat, classification

Distribution and Abundance of the Ganges River Dolphin (*Platanista gangetica*) in the Ganges River System

-Naman Goyal

Ganges River Dolphin has suffered a major decline in its distributional range and is believed to be suffering population decline. In this study, we aim to estimate the population of river dolphins in the Ganges mainstream while reviewing the distributional range of this species across its tributaries in Bihar.

Boat surveys were conducted in Bihar and West Bengal covering the rivers Ganges and Hooghly. In the Ganges, a double-observer based Mark-Recapture framework was used for estimating (Lincoln-Peterson estimator) the population of dolphin. In the Hooghly, from Farakka to Kolkata, a single observer boat survey was followed, however, a double observer method was followed from Kolkata to Gangasagar and in the Roopnarayan tributary.

To understand the extant distributional range of the dolphin, questionnaires coupled with active observations were conducted across 8 tributaries of the Ganges in Bihar in the dry season. A total of 1337±43 SE individuals were estimated in 625 km of the Ganges in Bihar. In the Hooghly River, a minimum count of 236 individuals was recorded in a 500 km stretch, while 25 individuals were recorded in the 32 km stretch of the Roopnarayan River. Out of the 8 tributaries of the Ganges, only three had presence of the dolphin in the dry season (Kosi, Mahananda and Dahuk). However, out of 240 interviewees, 80% claimed that the dolphin is seen during monsoon and post-monsoon across all surveyed tributaries.

The Ganges River system is currently the stronghold for the river dolphin population. Stretches between Chausa and Ballia, U.P. and Vikramshila Dolphin Sanctuary (Sultanganj to Manihari) showed the highest abundance of dolphins. These areas should be of utmost interest for conservation of this species. Further, seasonal movements of dolphins into the tributaries need to be studied on a longer term for understanding the importance of these tributaries in terms of dolphin ecology and its conservation.

Keywords: Population monitoring, Mark-Recapture, Seasonal movement, Tributaries