2nd ENDANGERED SPECIES RECOVERY PROGRAMME

भारतीय वन्यजीव संस्थान
Wildlife Institute of India

2nd ENDANGERED SPECIES RECOVERY PROGRAMME

23rd August 2019

Programme & Abstracts

भारतीय वन्यजीव संस्थान
Wildlife Institute of India

Programme

SEMINAR CHAIRPERSON
Dr. S. K. Khanduri, Former IG (WL), MoEFCC

INAUGURAL SESSION

0930 – 0935 h	Welcome	**Dr. K. Sivakumar,** *Scientist-F, WII*
0935 – 0945 h	Opening Remarks	**Dr. G.S. Rawat,** *Dean, WII*

TECHNICAL SESSION – I

Chair	**:**	**Prof. Qamar Qureshi, Scientist-G**
Co-Chair(s)	**:**	**Dr. K. Sivakumar, Scientist-F**
		Dr. J.A. Johnson, Scientist-E

Poster Presentation (Mixed Bag): Speed Talks

Time	Title	Presenter(s)
0945-0948 h	Use of advanced technology for monitoring Gangetic River Dolphin and its habitat	**Sajal Sharma**
0948-0951 h	Prevalent diseases of livestock around Keibul-Lamjao National Park, Manipur	**Nengneikim Baite**
0951-0954 h	A preliminary analysis of stress levels in wild and captive population of Sangai	**Tennison Gurumayum**
0954-0957 h	Distribution pattern of Sangai and Hog deer in Keibul Lamjao National Park	**Nongmaithem Bijyaluxmi Devi**
0957-1000 h	Involving local communities in the conservation of Sangai at Keibul Lamjao National Park	**Endrea Moirangthem**
1000-1003 h	Gut content analysis of Dugong of Gujarat and Tamil Nadu	**Sumit Prajapat**
1003-1006 h	Mapping seagrass meadows of the Gulf of Kachchh: Turbidity's well-kept secret	**Diksha Dikshit**

Oral Presentation
AQUATIC SPECIES

1010-1025 h	Abundance and habitat use of Dolphins in Protected Area: Kaziranga National Park, Assam	**Abhishek Bettaswamy,** Project Fellow
1025-1040 h	Abundance and habitat use of Dolphins in human use area: Goalpara	**Harshini Y. Jhala,** Project Fellow
1040-1055 h	Status of Ganges dolphins (*Platanista gangetica gangetica*) in tributaries: Subansiri, Kulsi and Chambal	**Sunny Deori,** Project Scientist **Ayan Dutta,** Project Fellow

1055-1110 h	Seeing the unseen: **Understanding habitat use and activity pattern of Ganges River Dolphin** and the effects of ship traffic	*Merin Jacob* Project Fellow
1110-1125 h	Seeing the unseen: Understanding habitat use and activity pattern of Ganges River Dolphin and the **effects of ship traffic**	*Gargi Roy Chowdhury* Project Fellow
1125-1140 h	**Tea**	
1140-1155 h	Associated aquatic biodiversity status of river Brahmaputra	*Anurag Rokade & Ramesh Prajapat* Project Assistants
1155-1210 h	Community outreach and conservation education	*Shovana Ray,* Project Scientist *Kanad Roy,* Project Fellow *Hiyashri Sarma & Yogi Raj Nobis,* Project Assistants
1210-1225 h	Understanding Dugong foraging patterns in the Gulf of Kachchh, Gujarat	*Sameeha Pathan,* Project Fellow
1225-1240 h	Dugongs and Seagrasses: what the community has to say	*Rukmini Shekar,* Project Fellow
1240-1255 h	Assessing the status of critical dugong habitats in the Andaman Islands	*Sohini Dudhat,* Project Fellow
1255-1330 h	**Discussion & Remarks by Chair and Co-Chairs**	
1330-1430 h	**LUNCH**	

TECHNICAL SESSION – II
TERESTRIAL SPECIES

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

Co-Chair(s) : **Dr. Parag Nigam, Scientist-F**
Dr. Bilal Habib, Scientist-E

1430-1445 h	Recovery of Bustards in India	*Sourav Supakar,* Project Assistant
1445-1500 h	Conservation of Sangai: Dealing with veterinary issues and disease	*M. Vikramjit Sharma,* Project Associate
1500-1515 h	Dependence of local people on natural resources of Keibul Lamjao National Park, Manipur	*Akoijam Santikumar Singh,* Project Fellow
1515-1522 hr **(Speed talk)**	Preliminary insights into the evolutionary history of Sangai (*Rucervus eldii eldii*) based on Bayesian analysis of complete mitochondrial genomes	*Mirza Ghazanfar Ullah Ghazi,* Assistant Conservation Officer
1522-1540 h	**Discussion & Remarks by Chair and Co-Chairs**	
1540-1555 h	**Concluding Remarks by the Seminar Chairperson**	
1555-1600 h	**Vote of Thanks**	*Dr. K. Vishnupriya,* Scientist-C

*****

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

-Sajal Sharma

Introduction: 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.

Aim: For understanding the ecology, behavior and conservation of the River dolphin and other associated aquatic species, we integrate ecological sampling and advanced technology fields like, specialized sensors, Passive Acoustic Monitoring devices (PAMs), and Aerial Drones/UAVs.

Location: Chambal River (Madhya Pradesh), Headquarters (Dehradun)

Methods: For understanding dolphin behavior and activity in the turbid waters of Indian river system and also to act as a correction factor for the double observer method used for dolphin estimation, Drones/UAVs were used. Design and Development of Instruments 1) Audio moth, audio recording device capable of recording audible and ultrasonic frequencies and 2) Water Testing Kits, contains probes like pH, TDS, water flow, water temperature and atmospheric temperature, pressure and humidity for Water parameter Recording along with GPS coordinates.

Result: The use of Drones/UAVs helped in achieving a 3rd observer-based information which act as a correction factor for the Visual observation method in dolphin estimation. Additional information on turtles, reptiles and birds were obtained. The use of Ariel Drones/UAVs also provided another perspective on dolphin behavior.

In house development of Instruments, like AudioMoth and Water Quality Testing Kit shows that it is cost effective to Design and Develop this devices in India. For deployment of this devices hard case was designed and 3D printed in the institute itself.

Keywords: Data-Loggers, Equipment-design, PAM, Drones/UAV.

Prevalent diseases of livestock around Keibul-Lamjao National Park, Manipur

-Dr. Nengneikim Baite

Aim: Multi-host pathogens are responsible for outbreak of diseases in endangered wild animals and can adversely affect their population structure. Livestock are often host/carrier of such diseases. The present study was conducted to identify villages around Keibul Lamjao National Park (KLNP) for veterinary intervention.

Study area: Field surveys were conducted in 14 villages (42 localities) surrounding the park. All the villages were categorised into four clusters to facilitate the livestock assessment. These villages are dominated by Meitei communities and rear livestock such as cattle, buffalo, swine, goat, poultry etc.

Methods: We examined livestock and carried out door to door questionnaire survey with the help of Forest guards and assistants. Information on the livestock and prevailing diseases and vaccination records of the animals were collected. The study mainly focused on bovid, caprine and swine as they impose major threat on the ungulates.

Results: Two villages in the south cluster had the highest livestock population viz. Kumbi (bovine 352, swine 90) and Wapokpi (bovine 97, swine 31) followed by Laphupat Tera (bovine 125, swine 25) in the east. The south cluster had the highest number of diseases such as Foot and Mouth Disease (FMD-24), Black Quarter (BQ-16) and others (9). A total of 24 Vaccination camps and four veterinary awareness camps were organised in 12 villages during 2018-19. Six post-mortems were performed on swine (2) and hog deer (4) and lesions similar to swine fever were detected in swine. Pneumonia, drowning, predation by wild boar and old age were observed to be the cause of death in the case of hog deer. As a part of trust building activity to strengthen Sangai conservation, free animal healthcare was provided and parturition was assisted. A total of 64 cases were successfully treated for parvo-infection, skin infections and diarrhoea.

Conclusions: Despite regular vaccination and awareness camps around the fringe villages, the southern and eastern clusters showed higher cases of diseases. Better community participation in vaccination and awareness programmes will address the problem.

Keywords: Diseases, FMD, livestock population, vaccination

A preliminary analysis of stress levels in wild and captive population of Sangai

-Tennison Gurumayum

Aim: Fecal glucocorticoid metabolite (FGM) concentration is a reliable indicator of stress in wildlife population and is widely used non-invasive method for quantifying stress. The present study was conducted to measure the FGM in wild and captive populations of Sangai to assess the stress levels for developing an appropriate conservation strategy for both wild and captive populations.

Study area: Keibul Lamjao National Park (KLNP), Manipur Zoological Garden, Imphal and Alipore Zoological Garden, Kolkata.

Methods: Fresh fecal samples were collected and stored at -20 ºC for analysis. FGM was extracted by pulse vortexing dry powdered fecal (0.1 g) material with 15 ml of 70% ethanol, followed by centrifugation. Corticosterone EIA kit was used to measure glucocorticoid (GC). Assays were validated through parallelism and accuracy test. Post data generation from all the samples. Mann-Whitney U test was used to determine the stress level differences between the groups.

Results: The result shows significantly ($U=58$, $p<0.05$) higher levels of mean FGM concentration in wild population (28.73 ± 16.93 pg/50 µl, n=10) than the captive population (n=30). This indicates that the wild population is more stressed than the captive populations. FGM level also varied significantly between the two different captive population ($U=18$, $p<0.05$) with higher concentration of FGM in Manipur Zoo population (19.05 ± 3.29 pg/50 µl, n=15) than Alipore Zoo (10.71 ± 11.94 pg/50 µl, n=15). Further, it is required to include samples from different captive populations and additional samples from KLNP to enhance our understanding of the species well-being in their respective habitats which will help in planning conservation and management strategies for the remnant wild population.

Keywords: Conservation breeding, enzyme-immunoassay, fecal glucocorticoids, stress.

Distribution pattern of Sangai and Hog deer in Keibul Lamjao National Park

-Nongmaithem Bijyaluxmi Devi

Identification and monitoring of the core habitat areas are crucial for planning effective conservation and management strategies for wildlife habitats. The present study was conducted in Keibul Lamjao National Park, Manipur, during 2017-18 to identify the distribution pattern and habitat use of Sangai and Hog deer by assessing the pellet distribution and habitat parameters inside the Park.

The Park was stratified into grids of 1 km x 1 km and in each grid 2-3 strip transects of 500 m length and 2 m width were laid randomly depending on the phumdi thickness and accessibility. At every 50 m interval, quadrat of 0.5 m x 0.5 m was laid to record the habitat parameters. A total of 73 transects covering 28 grids were carried out. The pellet density was calculated as number/ km^2. Generalized linear model was used to derive the habitat use.

The fecal pellet of Sangai and hog deer was recorded in 13 km² and 23 km² respectively out of the sampled 28 km² area of the Park. The overall pellet density was estimated to be 0.15 ±0.03 and 0.99 ± 0.09 pellet/ km^2 for Sangai and hog deer respectively. The high (6 km²), medium (3 km^2) and low (4 km^2) density area had 12.5 ± 4.56, 6.33 ± 1.86 and 2.25 ± 0.25 pellets/km^2 respectively for Sangai. Whereas, the high (8 km^2), medium (10 km^2) and low (5 km^2) density area had 54.38 ± 8.44, 20.9 ± 3.86 and 9.4 ± 1.7 pellets/km^2 respectively for hog deer. The habitat use by Sangai was significantly ($p<0.05$) influenced by phumdi thickness (0.65 ± 0.16), vegetation cover (0.63 ± 0.17) and short grasses (0.68 ± 0.37) whereas hog deer was significantly influenced ($p<0.05$) by vegetation cover (0.19 ± 0.06), phumdi thickness (0.22 ± 0.08) and short grasses (0.24 ± 0.11).

The result showed limited occupancy of the park area by Sangai whereas hog deer occupancy occurred throughout the park. This can be attributed to habitat parameters such as thin phumdi and availability of shelter grass.

Keywords: Pellet density, habitat use, distribution

Involving local communities in the conservation of Sangai at Keibul Lamjao National Park

- Endrea Moirangthem

Participatory conservation has proven a successful approach in biodiversity conservation especially in protected areas across the globe. The understanding of wildlife conservation by local communities is best achieved when there is collaboration between park and local communities. The present study was conducted to assess the social impacts created by different conservation awareness and community outreach programmes taken up in and around Keibul Lamjao National Park (KLNP).

KLNP is the only natural home for the endangered Sangai. The study was carried out in 36 villages surrounding the National Park in Bishnupur and Imphal west district of Manipur as most of the local communities were dependent on park resources.

The target villages for community awareness and outreach programs were selected on the basis of the location of villages in respect to KLNP and socio-economic conditions. Most of the programs were done in the eastern side of the park as poaching rate is higher in comparison to other areas and the poor socio-economic status of the villages. Two days prior to the conservation program, publicity was organised to the host village for motivating people to attend such programmes.

A total of 27 awareness and 16 community outreach programs followed by two site level workshops were conducted in the surrounding villages of KLNP. The village-level programs culminated in two state level workshops in which bureaucrats, local media, legislators, policy makers, government departments, NGO's, educational institutions and other stakeholders participated. Suggestions and recommendations made by the local people and various stakeholders during the village level consultations were discussed during the state level workshop to develop a science-policy/advocacy-livelihood intervention, strategy for reducing the dependency of local communities on park resources. Subsequently, series of trust-building, capacity building, and livelihood training camps were carried out to garner local community support. And four self-help groups comprising of local women were formed as a means for diversifying the livelihood options.

These interventions are creating a positive environment for developing a larger societal constituency for the conservation of the Sangai as well as sustainable development of the local communities.

Keywords: Community participation, livelihood, capacity building, stakeholder consultation, sustainable development

Gut content analysis of Dugong of Gujarat and Tamil Nadu

-Sumit D. Prajapati

Aim : Dugongs primarily consume seagrasses as well as algal matter and invertebrates in areas of low seagrass abundance. In this study, we analysed the dietary composition of gut samples obtained from stranded dead individuals from Tamil Nadu (TN) and Gujarat coasts to understand the food habits of dugong.

Location: Gulf of Mannar and Palk Bay, Tamil Nadu; Gulf of Kachchh, Gujarat

Methods: Gut samples were collected from dead stranded dugongs from TN (n=3) and Gujarat (n=2) and divided into subsamples of 1gm each,for further analysis under stereo-microscope (10x). Samples were homogeneously spread on petriplate with quadrates of equal area (1sq. cm) and randomly chosen 25% area was used to count the seagrass leaf fragments.Latter was identified based on morphology, shape, size and epidermal cells structures till genera level.

Results: Wefound five genera of seagrasses in TN samples (*Cymodocea* spp.*, Halophila* spp., *Halodule* spp., *Syringodium and Enhalus* spp.) and two in Gujarat (*Halophila and Halodule* spp.).In Tamil Nadu, *Cymodocea* spp. (2.76±4.55) was the dominant seagrass followed by *Halophila* spp. (1.64±1.41), *Syringodium spp.* (0.87±1.24), *Halodule* spp. (0.72±0.87) and *Enhalus* spp. (0.01±0.04) found in the gut contents.In Gujarat, *Halodule* spp. (4.75±5.94) was the most frequently seagrass followed by over *Halophila* spp. (2.34±2.39) and algal matter (0.22±0.64). Although there was significant difference in mean occurrence of *Halophila* and *Halodule* between TN and Gujarat samples (t=-2.006, df=116, p<0.04, and t=-6.049, df=116 p<0.0001, respectively). In addition,occurrence of non-biological materials (plastics and microfilament)from both TN (n=1) and Gujarat(n=1)is the major concern now.

Conclusion: Owing to the current results, *Cymodocea* spp. was dominant food source in TN and *Halodule* spp. in Gujarat.Though we need to perform extensive seagrass surveys in the field sites to validate and comment on the diet preference of dugong to understand its feeding ecology.Differential digestion too needs to be considered since it affects the relative abundance of seagrass species in the gut. Presence of non-biological materials indicates that the area might have anthropogenic pressure.

Keywords: Seagrass; diet composition; epidermal cells; Tamil Nadu; Gujarat

Mapping seagrass meadows of the Gulf of Kachchh: Turbidity's well-kept secret

-Diksha Dikshit

Aim: Being critical habitat of a diminishing dugong population in Gujarat, knowledge about changes in extent, distribution and nature of local seagrass meadows is important. Considering this, the seagrasses in Gulf of Kachchh (GoK) were mapped to assess their extensiveness and characteristics in these turbid waters.

Location :Gulf of Kachchh Marine Nation Park and Sanctuary, Gujarat.

Methods :Through the macro-tidal regime of mixed-semidiurnal tides in the gulf, exploratory surveys and mapping efforts were made in inter-tidal zones during minus to ebbing tide slot. Meadow-perimeter walking and range estimation in a grid (1x1km) based system were used for mapping the meadows. Random quadrats (138) were laid to study physical and chemical characteristics of seagrasses.

Results: About 119 ha of seagrass beds were found in the surveyed intertidal zones of Bhaidar (34 ha), Chusna (30 ha), Pagar (27 ha), Ajad (23 ha) and Noru (5 ha) respectively. Four seagrass species; *Halodule uninervis, Halophila ovalis, Halophila beccarii,* and newly discovered in the gulf, *Halophila decipiens* were recorded in these beds. Bhaidar and Noru were the most species rich of all surveyed islands, harbouring all four recorded species. However, the maximum seagrass cover was observed at Pagar (41.62±SD25.98%), followed by Chusna (23.41±SD22.2%), Bhaidar (17.54±SD18.39%), and Noru (13.8±SD12.49%). Furthermore, extensive complexes of dugong feeding trails as long as 20m in the meadows of Bhaidar (n=at least 20), Chusna (n=at least 25) and Noru (n=8) were discovered for the first time.

Conclusion: Despite the extremely low water clarity (<1.5m in April-June), the surveyed region supports considerably diverse seagrass beds. Extensive mapping of seagrass associated benthic features such as corals, rubble, channels, sand, mud etc., through advanced remote sensing and aerial photography techniques can reveal the true extent of obscured dugong habitats. Presence of immense webs of dugong feeding trails at Bhaidar, Chusna and Noru highlights the vitality of intense conservation efforts in these regions of GoK.

Keywords: Critical habitat; tidal regime; inter-tidal zone; *halophila decipiens*; dugong feeding trails

Abundance and habitat use of Dolphins in Protected Area: Kaziranga National Park, Assam

-Abhishek Bettaswamy

Aim: Studying habitat and its associated features is important as it plays an important role in limiting the abundance and distribution of a species. This study mainly focuses on estimating the abundance, distribution and habitat use pattern of Gangetic river dolphins in part of the Brahmaputra River that flows through Kaziranga National Park (KNP).

Location: Brahmaputra river stretch in Kaziranga National Park, Assam

Method: The abundance of Gangetic river dolphin in the study area was estimated using double observer mark recapture technique. The river was divided into 2 km segments for ease of survey and estimation of other parameters. These were classified into different riverscape features, wherein depth, velocity and fish habitats were measured. Additionally, CPODs were deployed in these segments to understand the acoustic activity pattern and habitat use, amongst different habitats.

Results: The abundance of Gangetic river dolphin in the study area was estimated to be 125 ± 24.33 individuals (including Adult, Sub-adult and Calf). Wide channel was the most repetitive river type with total of 17 segments. The average depth and velocity were 4.83±1.28 meters and 0.50 ± 0.14 m/s respectively, estimated in the lean water period. The shallow areas provide refuge sites for fishes. A total of 3447.21 hours of acoustic recording in 43 segments was also used for analysis of habitat use. Dolphins were more active in daytime in Confluence, meanders and mid-channel island river types. The distribution dolphins were found to be influenced by river depth, velocity and fish. Complex habitat structures like confluence, meander and Mid-channel island were found to be important in terms habitat use pattern.

Conclusion: Gangetic river dolphin was active throughout 24 hours duration. But the activity time period varied with different habitat structures. The dolphin abundance was also affected by fish availability and physical parameters like discharge and velocity.

Keywords*: Protected area, cetaceans, habitat suitability, acoustic monitoring, fishes*

Abundance and habitat use of Dolphins in human use area: Goalpara

-Harshini Y. Jhala

Aim: To investigate the abundance and habitat use of Gangetic river dolphins in Human use area: Goalpara

Introduction: The Gangetic river dolphin is restricted to the river systems of Ganga, Brahmaputra and Indus (mainly Pakistan). Although classified as Endangered under the IUCN red list, insights on abundance and habitat use of these cryptic species remain sparsely studied. In this study, we investigate the abundance and habitat use of river dolphins at Goalpara-Dhubri stretch of Brahmaputra river, Assam. The study was conducted between March and May 2019.

Location: Goalpara-Dhubri stretch of Brahmaputra river, Assam

Methods: Repeat survey using double observer method was used to estimate abundance of dolphins at the study site. Data on habitat covariates like prey, channel type, depth, discharge, velocity and anthropogenic pressures were collected. To understand habitat, use of dolphins, generalized linear models were used.

Results: Encounter rate of dolphins in the Goalpara-stretch was found to be 0.51. Average dolphin Abundance of the three survey in the region was 49.3 (±3.6) for 84 Km stretch. Dolphins preferred Mid-Channel Islands (60%) over other habitat types like braided confluences (19%) and wide channels (15%). The results of the study also suggest that fish (prey) has a positive influence on dolphin abundance ($p<0.05$). Velocity and discharge had a negative influence on dolphin habitat use ($p<0.05$).

Conclusions: In comparison to Kaziranga National Park where average abundance was 124 (± 24) individuals for 92 Km stretch, Goalpara-Dhubri had lesser abundance. Habitat features play an important role in determining the fish and dolphin distribution. Protection is a key feature of dolphin persistence and abundance.

Keywords: Anthropogenic stressors, habitat suitability*, Platanista gangetica,* protection.

Status of Ganges dolphins (*Platanista gangetica gangetica*) in tributaries: Subansiri, Kulsi and Chambal

-Sunny Deori & Ayan Dutta

Aim: The study aims to estimate the i) abundance and distribution of Ganges dolphins in the tributaries of Brahmaputra and the Chambal river and ii) effect of habitat characteristics and anthropogenic pressures on the Ganges dolphin distribution.

Location: Subansiri, Kulsi (in Assam) and Chambal River (in Madhya Pradesh).

Method: Survey was carried out using double observer method, with two independent teams using single boat with two platforms or two boats moving in tandem or single boat. Encounter rates of dolphins was estimated. Habitat characteristics and anthropogenic activities were recorded every 1km in Subansiri and every 300m in Kulsi. Chi- square test was done to understand the relation between the distribution of dolphins and habitat and anthropogenic pressures.

Results: The average encounter rate was 0.06 (SE=0.001), 0.37 (SE=0.001) and 0.26 (SE=0.03) dolphin/km in Subansiri, Kulsi and Chambal respectively. Dolphin distribution was found significantly skewed towards meanders, confluences and deep pools ($\chi2$=49.53, df=4, p-value=0.001). Dolphins were observed significantly higher in low fishing zones ($\chi2$=58.27, df=3, p-value=0.001) and in low sand mining areas ($\chi2$=97.74, df=3, p-value=0.001). Irrigation pumps and sand mining activities were recorded throughout the stretch of Chambal.

Conclusion: Harmful anthropogenic activities such as Mosquito net fishing and sand mining activities were observed throughout the seasons in the tributaries. This is directly affecting the prey resource of dolphin and subsequently the survival of dolphin populations. Recently the construction of ITC factory campus has altered the river morphology and will have a detrimental effect on a major dolphin hot-spot area at the Kulsi- Bata river confluence.

Keyword: Confluence, meander, mechanised sand mining, mosquito net fishing, ITC factory.

Seeing the unseen: Understanding habitat use and activity pattern of Ganges River Dolphin and the effects of ship traffic

-Merin Jacob & Gargi Roy Chowdhury

Aim: The study aims to understand the activity pattern of Ganges River Dolphin (*Platanista gangetica gangetica*) and the effect of various anthropogenic pressure on the behaviour, particularly due to shipping traffic. Shipping traffic from domestic and international commercial vessels is a major concern for pollution in the dolphin habitat. To understand this complex issue acoustic activity of dolphins was studied with the passing of varied ship types.

Location: Goalpara-Dhubri, Kaziranga and Kulsi in Assam and Hoogly River stretch in West Bengal

Method: To study the activity pattern and the behaviour of the dolphin, CPODs were deployed in segments of 2km in Brahmaputra. In Hoogly, to study the same Hydrophones along with CPOD were deployed following tidal cycles and logistical suitability. In all sites, the site of deployment was selected based on previous Dolphin Abundance Survey data.

A total of 6650 hours of acoustic data were analysed. Detection Positive Minutes were used to determine the presence of the dolphin and activity pattern throughout the hours. Over 1000 under-water sound recordings of river vessels of all size class were made using hydrophone.

Result: The overlap in activity pattern amongst all rivers is >70%, indicating no discernible diel activity differences. However, the diel activity pattern differs in different river habitats. In tidal habitat, the diel activity was found to be in relationship with the tidal cycle.

With no vessel traffic the ambient broadband sound pressure level(SPL) was 120.1 to 142.5 dB re 1μPa and with moderate to high vessel movement (that is mostly during peak tide) the ambient SPL was 142.8 to 149.2 dB re 1μPa.

Conclusion: The use of acoustic data shows that River Dolphin is found to be active throughout the day. Preliminary analysis indicates trends of shift in certain acoustic patterns that need further examination. The role of biological constraints and effect of regularity of ship traffic are aspects that need to be accounted for to make robust conclusions regarding effect of ship traffic on dolphin acoustic activity.

Keywords: Diel activity pattern, river dolphin, ship traffic, tidal cycle

Associated aquatic biodiversity status of river Brahmaputra

-Anurag Rokade & Ramesh Prajapat

Aim : The main objective of this study was to understand the status of aquatic biodiversity associated with populations of Ganges river dolphins, like fishes and plankton, which are crucial for dolphin and ecosystem health.

Location: The study was carried out in different localities of River Brahmaputra (Kaziranga National Park & Goalpara), and it's tributaries Subansari and Kulsi.

Methods: Sampling for fishes was done by using gill net, cast net, drag net, scoop net and kick nets of different mesh size. The unidentified specimens were kept in ethanol for further morphometric and molecular analysis. To understand density, net effort and catch per unit effort (CPUE) were calculated and segregated according to river habitat/river channel. Species richness was calculated to understand the diversity of fish species. The sampling for planktons was carried by using conical plankton deployed for 15 mins. Plankton samples were preserved in 5% formalin for lab and microscopic analysis.

Results: The study recorded a total of 79 species of species, out of which 55 species were from Subansari River, 62 species from river Brahmaputra and 32 species from Kulsi River. These belonged to 43 genera in 20 families. Among which Cyprinidae was dominant with 20 species. Analysis of net effort suggests that gill nets and cast nets have higher fish capturing capacity.

A tot 90 genera of phytoplankton were recorded, out of which Bacillariophyceae (42 Genera) is most dominant followed by Charophyceae (6 Genera). Bacillariophyceae is dominant in KNP, while Charophyceae in Goalpara. The study suggest that the density and diversity of phytoplankton is high relatively in Kaziranga as compared to Goalpara.

Conclusion: Complexity of habitat influences diversity of fish species. Dominance of Bacillariophyceae in Kaziranga indicates oligotrophic conditions, indicating optimum nutrient conditions. The presence of diverse Cyanophyceae species in Goalpara indicates that water has organic pollutants. Both fish and plankton abundance are influenced by overall protection measures and human use. Presence of particular plankton species is a good indicator of water habitat quality.

Keywords – Fishes, phytoplankton, Brahmaputra river system, diversity, channel type

Community outreach and conservation education

-Shovana Ray, Kanad Roy, Hiyashri Sarma & Yogi Raj Nobis

Aim: Aim of this study was to understand social perception regarding Ganges river dolphins (GRD) and to enhance participatory conservation measures with thorough stakeholder engagement. GRD suffers severe anthropogenic threats, and this threat is exacerbated by the lack of proper implementation of wildlife laws. In this scenario, community perceptions significantly impacts the survival of dolphin populations.

Location and Method: Using semi structured questionnaire, fishermen (N=100) were interviewed about GRD and fishing practices in West Bengal. Following the survey, workshops were undertaken with primary school students (N=260) and fishermen (N=85). Extensive village outreach programme was designed for fishing communities around Farakka selected on the basis of 2018 social surveys. Students participated in Bengali creative story writing (N=200) and sentence completion tests (N=105) on GRD. Moreover, door to door awareness pamphlets were distributed along with feedback data (N=373).

In Assam, awareness programs were conducted in 22 riverside schools near existing dolphin habitats of 13 districts of Brahmaputra valley. Presentations were conducted with 16 posters describing facts on dolphins in Assamese. Among Students (N=3674) and teachers (N=215), 593 evaluation forms were recorded to assess the event effectiveness. Fishermen awareness programmes (on Assam Fishery Act 1953) were conducted in 18 fishermen villages (N=717) in collaboration with Assam Fishery Department as an attempt to develop sustainable fishery where Fishery Development Officers (N=19) participated as resource persons.

Result: From thematic analysis of fishermen narratives, it was found that river GRD is perceived as a conflicting predator competing for the common prey- fishes in the river. Combining data from Farakka school outreach, 77% of respondents provided factual information about dolphin oil extraction. In Assam, 51 % of students identified GRD correctly and 60% of them selected dolphin oil as reason for GRD killing. 92% of the audience supported the need for GRD conservation after witnessing the presentation.

Conclusion: There is a persistent strong belief in the use of dolphin oil for medicinal and bait fishing. This belief needs to be tackled with a targeted multidimensional approach. Overall, community engagement is an important factor for the survival of dolphins, and site based approach needs to be adapted.

Keywords: Social survey, dolphin awareness programmes, dolphin oil

Understanding Dugong foraging patterns in the Gulf of Kachchh, Gujarat

- Sameeha Pathan

Aim: Dugongs are the only exclusively herbivorous marine mammal and are known for their clever selective-foraging strategies. These benthic foragers select meadows which harbour the rapidly growing and early pioneering species such as *Halophila ovalis,* over slower-growing but dominant and fibrous seagrass species *e.g. Enhalus acoroides.* Seagrass meadows in the Gulf of Kachchh are unique as they are insular, truncated by other benthic features and affected by mixed semi-diurnal tides. These physical factors in turn control the structural composition of seagrasses and substratum type. We try to address some of these factors on the basis of which a dugong might select its foraging habitat.

Location: South-western Gulf of Kachchh, Gujarat.

Methods: We used intensive area search method, wherein grid (100x100ha) based surveys in intertidal zones were done. Seagrass meadows extent was mapped using perimeter walking method and with the aid of range-finder. GPS waypoints were fixed for each benthic feature, quadrats and trails. Trail length and number were noted. Using random quadrat method, seagrass and sediment samples were harvested. The samples were further processed to estimate seagrass composition, biomass, shoot density.

Result: Dugong feeding trails were found in meadows of Chepri (n= >25), Bhaidar island (n= >20), Taam (n= 8) and Balapur Island (reoccurring sightings). No trails were found on Hankiwala reef, which was then used as a control area. Chepri reef had biomass of 706.25±125.3 and shoot density ratio of *Halophila* (HO)/*Halodule* (HU)-2.24, Bhaidar island biomass and HO/HU ratio was 220.75±45.99 gms/sqmt and 2.01, Tam reef had *Halophila* biomass 572±208 and Hankiwala reef, the control site's biomass 420.01±83.95 gms/sqmt and HO/HU- 1.4. Also, areas where trails were found were meadows that are dominated by mud-silt-sandy substratum.

Conclusions: Dugongs preferred foraging on seagrass meadows which are morphologically smaller, younger, sparse and have relatively less biomass and lose substratum. Relative shoot density estimates imply that morphologically smaller *Halophila was* more abundant than the fibrous *Halodule* in the areas where trails were found. Characterisation of such foraging habitats will help directing conservation and management efforts to other potential foraging zones. During high-tides, such areas should be ideal for dugong sighting and population estimation.

Keywords: Benthic forager, selective foraging, seagrass meadows, seagrass morphology, semi-diurnal tides

Dugongs and Seagrasses: what the community has to say

- Rukmini Shekar

Aim: Understanding the relation between Traditional Ecological Knowledge of the community with Dugong and Seagrass conservation.

Location: Study area extends from Adhiramapattinam to Mandapam, Palk Bay, Tamil Nadu, along 180km of coastline and covering over 2000km^2 area.

Methods: Palk Bay was surveyed for cover and abundance of seagrasses using quadrat method. 528quadrats were surveyed (along 80pre-defined transects) in a stratified manner in 27sites.

Interview-based questionnaire surveys were conducted to understand the Traditional Ecological Knowledge (TEK) and conservation perspectives of fishermen. 440fishermen from 24villages were interviewed.

Results: Seagrass cover was highest in Central Palk Bay (79.42%), moderate in North (67.05%) and least in South (58.52%) Palk Bay regions. Most Dugong sighting and stranding records have been obtained from North Palk Bay, where seagrass cover is moderate. Biomass and abundance of seagrass in this region were lesser due to presence of small-sized seagrass species, like *Halophila* and *Halodule* sp., which are preferred food for dugongs. Substratum of meadows was silt in areas of fresh water influx, or a silt-sand mix; or sand. Central Palk Bay had a high abundance of seagrass where substrate was mostly silt-sand or sand. *Cymodocea* and *Syringodium* sp., which are of lesser dietary importance to dugongs, were most abundant. South Palk Bay had sandy substratum with no species specifically dominating others in abundance. Overall, *Cymodocea* sp. was dominant in Palk Bay.

Of 24 villages located in North Palk Bay, dugongs were seen by fishermen frequently off the coasts of 11 (above 80% respondents). Therefore, coastal and offshore areas of Adiramapattinam to Ammapattinam, North Palk Bay has been proposed as Dugong Conservation Reserve, covering 360km^2 area. Major fishing gear used were set and drag nets made of nylon- a threat to dugongs. Majority of fishermen (75.92%) interviewed personally sighted dugongs and 50.86%of interviewees had sighted dugongs in the last one year. Further, 25.56% interviewees reported a decline in seagrass habitat in last 5 years.

Conclusion: Dugongs prefer meadows with moderate seagrass cover (North Palk Bay) over low (South) or high density (Central) meadows.

Keywords: TEK, fishing, interview, seagrass cover, threats

Assessing the status of critical dugong habitats in the Andaman Islands

-Sohini Dudhat

Aim: The estimated population of dugongs in Andaman and Nicobar islands is <30 individuals and is under threat due to habitat degradation and hunting. In view of increasing tourism in the islands followed by infrastructure development, the threats to dugong habitats are supposed to exacerbate. In this study, we assessed the status of Critical Dugong Habitats (CDHs) by characterizing the seagrass meadows and quantifying threats in terms of vessel traffic and plastic pollution in CDHs.

Location: We selected four CDHs– Mayabunder, Wandoor (Mahatma Gandhi Marine National Park), North (Rani Jhansi Marine National Park) and South Ritchie's Archipelago.

Methods: We laid 45 Line Intercept Transects (50m) to assess seagrass meadow characteristics and grid-based (2 x 2 km) point-count sampling technique to map threats in 404 km^2 area.

Results: 11 species of seagrasses were recorded at intertidal and sub-tidal meadows (depth range 0.5 to 20.5m). Mean seagrass cover was highest in North Ritchie's (38.70 ± SD40.46%) followed by Mayabunder (37.95 ± SD34.33%) > Wandoor (29.03 ± SD35.96%) > South Ritchie's (21.28 ± SD28.92%). The dry biomass was highest at Mayabunder (48.4± SD5.12 g/m^2) > South Ritchie's (18.7± SD4.13g/m^2) > North Ritchie's (17.8± SD2.21g /m^2)> Wandoor (12.4± SD1.51g/m^2). Highest shoot density of *Halophila* spp., preferred food of dugongs, was at Mayabunder (3733.33± SD959.27/m^2)> Wandoor (1745.83± SD1200.56/m^2) > South Ritchie's (893.18± SD578.15/m^2) > North Ritchie's (650± SD249.68/m^2).

The overall density of vessel traffic was 0.79 ± SD0.67 vessels/ km^2 in the study areas. Fishing boats were the major contributors to vessel traffic except for South Ritchie's, where recreational boats were more common. Overall mean density of floating litter was 0.56 ± SD0.41 items/ km^2 with plastic bottles and bags as major contributors (65%). Highest threat densities were recorded at South Ritchie's (litter=1.14 items/km^2, vessels=1.77 boats/ km^2).

Conclusion: We require seasonal replicates to estimate trends in spatio-temporal distribution of threats. We recommend South Ritchie's to be included in Rani Jhansi MNP as it is exposed to high densities of threats. Strict regulations on speed limits and sustainable tourism practices should be adopted.

Keywords Threat-mapping, seagrasses, boat-traffic, plastic, conservation

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)	: Sohini Dudhat / Project fellow
Funding Agency	: CAMPA
Project Duration	: 2016-2021

Recovery of Bustards in India

-Sourav Supakar

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 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, lands are being allocated to construct facilities in Sorsan (~7.5 km2) and Ramdevra (Area ~2 km2). A temporary center for incubation and hatchery was established in Sam Chowki, Jaisalmer. Two female Great Indian Bustards were Radio-Tagged this year. We received permission for GIB Egg collection and 8 eggs were successfully hatched artificially in the Conservation Breeding Facility at Sam.

Power-line surveys in Kutch showed mortality of ~22000 mortalities birds/year, in 1123 km^2 habitat in Kachchh. Additional ancillary information based on power-line carcass surveys (2 GIB mortalities in 20 km high-tension power-lines surveyed seven times) indicated that about 18 GIB deaths were estimated due to 152 km high-tension lines distributed across bustard occupied sites in Thar.

The first phase of dog sterilization program have been carried out with Humane Society International (HSI), ˜800 dogs from 23 villages were sterilized, vaccinated and released back.

Various interactive sessions have been conducted in schools of 18 villages (~2200 students), enabling the kids to have a better understanding about the importance and significance of the desert and its ecosystem. Two day skill development workshops for the frontline staff, guides and Nature enthusiasts of the area were conducted.

Publicity materials such as brochures for power agencies and other stakeholders, notebooks and bookmarks illustrating the flora and fauna of Desert have been prepared and disseminated. Power line mitigation for bustards were developed by the team to raise the awareness regarding the species and the efforts.

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

Conservation of Sangai: Dealing with veterinary issues and disease

-Dr. Manoharmayum Vikramjit Sharma

The Sangai (*Rucervus eldii eldii*) is found as a single, small and isolated population with low genetic diversity in Keibul Lamjao National Park (KLNP). The population is highly susceptible to inbreeding depression and climate change impacts such as flood, fire and disease. The aim of the study was to develop a wildlife disease monitoring protocol for surveillance based on prevalent diseases in livestock.

The Keibul Lamjao National Park (KLNP) located in the Barak-Chindwin-Irrawaddy Basin is one of the few floating National Park in the World. The total area of the park is 40 km^2 and surrounded by 36 villages within 3 km radius.

Faecal samples of Sangai and hog deer (n = 50) were collected and analyzed for parasitic diversity and load using sedimentation, flotation and Mc Master technique. Sick livestock around KLNP were regularly check for different clinical signs and symptoms for treatment as and when called upon by villagers or as informed by forest guards. Blood samples were collected for different diagnostic test.

The parasitic diversity recorded among Sangai and hog deer included Amphistomes, Strongyle, *Strongyloides* sp. with *Trichuris* sp. additionally present in Sangai. The overall prevalence of parasites in Sangai and hog deer was 92% and 100% with the samples having one or more parasites with variable load. Out of 14 samples tested for TB, 9 samples were positive. The other diseases recorded around KLNP are gastro-enteritis in dogs, swine fever in pigs, zinc deficiency in cattle, mange in dog and cattle etc. The study showed parasites prevalence in Sangai and hog deer similar to those reported in livestock. Diseases like Haemorrhagic septicemia, black quarter and swine fever which can be transmitted to the wild ungulates were reported from livestock. Detailed systematic study with robust sampling protocol is required including interactions of Sangai with livestock at the interface. Apart from this, WII team at KLNP also conducted different awareness and vaccination camps and assisted Manipur Forest Department in solving different veterinary issues. WII team also did body scoring and behavioural study on Sangai for translocation from Sangai second home to Manipur Zoo.

Keywords: Disease, parasites, livestock

Project Title	: Conservation Action Plan For Manipur's Brow-Antlered Deer: An Integrated Approach
Principal Investigator(s)	: Dr. S.A. Hussain & Dr. Ruchi Badola
Researcher(s)	: Dr. Chongpi Tuboi; Project Associate- Dr. M.V. Sharma; Project Fellows- Ak Santikumar Singh, Mirza Ghazanfar Ullah, Dr. S. Naosekpam, Dr. Nengneikim Baite & Tennison Gurumayum; Project Assistants- N. Bijyaluxmi Devi, Endrea Moirangthem
Funding Agency	: CAMPA
Project Duration	: 2016-2021

Dependence of local people on natural resources of Keibul Lamjao National Park, Manipur

-Akoijam Santikumar Singh

Aim: To explore local people's need and aspirations in terms of their dependence on natural resources of Keibul Lamjao National Park (KLNP).

Location: The present study was carried out in 36 fringe villages of KLNP, Manipur.

Method: Household questionnaire survey (N=354) was carried out using semi-structured questionnaire having both closed and open ended questions to determine the current socio-economic and demographic condition, dependency on the Park and their perception on Sangai and Park management. Seven entry points were monitored along the Park boundary across all seasons to examine the pattern of resource extraction from the Park.

Results: It was observed that in the villages surrounding the KLNP, the average household (HH) size was about 6 person/HH and the average annual income was INR 1,54,454 of which, 31.5% is contributed by income derived from the Park resources. More than half (54.8%) of the total HH was found to be dependent on the Park in the form of fishing (46.6%), vegetable (20.9%), fuel wood (8.47%) and the fodder (16.67%) collection. Majority (59.32%) of respondents perceived Sangai as an important animal, and expressed willingness to conserve it. They suggested collaborative and transparent conservation actions to improve the management effectiveness.

Conclusion: Present local dependence on the Park is mainly due to lack of livelihood options and mechanisms to address it. People's concern clearly highlights the need for inclusive management approach. Despite showing positive results, the current efforts of livelihood intervention and stakeholder consultation initiatives needs to scaled-up.

Keywords: forest dependency; livelihoods; participatory conservation; Sangai *(Rucervus eldii eldii)*; stakeholders

Preliminary insights into the evolutionary history of Sangai (*Rucervus eldii eldii*) based on Bayesian analysis of complete mitochondrial genomes

-Mirza Ghazanfar Ullah Ghazi

Aim: Sangai is one of the most endangered cervids of India existing as a single and isolated population in a limited habitat. We carried out Bayesian inference with fossil calibration to estimate the age of Eld's deer group and major divergence events using complete mitochondrial genomes to get insights into the evolutionary history of Sangai.

Methods: The complete mitochondrial genome (n=5) was sequenced (16357 bp) and partitioned using different partitioning schemes to obtain the best substitution models using the hierarchical likelihood ratio test. Markov Chain Monte Carlo runs of 50 million generations with a lognormal uncorrelated clock and Yule speciation tree was implemented in software BEAST to estimate the divergence events. The resulting node ages were used to calibrate the split among the Eld's deer subspecies.

Results: Our results suggest that the Eld's deer group diverged ~3.6 mya from the *Cervus/Rusa* group during late Pleistocene. Divergence estimates indicated that the Indian subspecies of Eld's deer diverged ~0.65 mya from its Southeast Asian sister subspecies. Phylogenetic reconstruction using 13 PCGs and mtDNA control region based on Maximum likelihood and Bayesian approach resulted in congruent tree topologies. Genus *Rucervus* was observed to be polyphyletic with *R. eldii* closely associated with *Elapharus sp.* and *R. duvaucelii* nested with the *Axis* group.

Conclusions:

The divergence of *Rucervus eldii eldii* from its other subspecies was possibly driven by the adaptations to the drier climates and open grasslands which once dominated the region as evident from several paleobotanical studies. The split event indicates the association of Sangai and the conversion of grassland ecosystems into agricultural lands resulting in habitat shrinkage over time. Based on the tree topology and in the light of the morphological affinity among *Rucervine* species, it is suggested that *R. eldii* may represent a different evolutionary lineage.

Keywords: Eld's deer, divergence, mitochondrial genome, *Rucervus eldii eldii*, Sangai

भारतीय वन्यजीव संस्थान
Wildlife Institute of India