

# ANNUAL RESEARCH SEMINAR

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## Programme & Abstracts



**Salim Ali Centre for Ornithology and Natural History**  
(A Centre of Excellence under the Ministry of Environment, Forest and Climate Change)  
**Anaikatty (Post), Coimbatore 641008**

## Developing a conservation action plan for the Endangered Forest Owlet (*Heteroglaux (Athene) blewitti*) - preliminary findings

- *Kaushik Koli*

The Forest Owlet (*Heteroglaux (Athene) blewitti*), an endangered bird, endemic to central India, has a severely fragmented range and is co-distributed with Jungle Owlet (*Glaucidium radiatum*) and Spotted Owlet (*Athene brama*). Its geographical distribution and factors governing it remain unclear. The current project aims to update information on Forest Owlet and prepare a Conservation Action Plan. A major objective of the study is to test a Species Distribution Model (SDM), prepared by us, which predicted a wider distribution than earlier known. We present results from a survey of three months (mid-March to mid-June 2018) from three regions in Maharashtra, Tansa Wildlife Sanctuary, Toranmaal Reserved Forest, and Nashik-Harsul.

Areas to be surveyed were gridded in 1X1 km cells. We used the call-playback method in an Adaptive Cluster Sampling format, starting from previously established locations of Forest Owlet. We collected data on 24 habitat attributes at each playback station. We sampled 82 grids with 141 playback stations and 166 attribute plots and compared detection and non-detection sites separately for three owl species, using the Kruskal-Wallis test. We also estimated habitat overlap amongst the species, using the Pianka index, which ranges from 0 (no overlap) to 1 (complete overlap).

Of 141 playback stations, we recorded 23 positive sites, of which 15 were from previously unreported locations. We detected Forest Owlet in low elevation (mean  $\pm$  SD) ( $164 \pm 89$  m asl) dry deciduous forests in plots containing wide-girth trees ( $69 \pm 30$  cm), especially teak ( $78 \pm 36$  cm), low tree density ( $0.04 \pm 0.02$  trees/m<sup>2</sup>) and understory cover (5.2% to 23.2%). The Forest Owlet and Jungle Owlet showed the maximum overlap (0.78) in their habitats.

In the future, we will continue testing, and improving the SDM with new records and higher-resolution climate and vegetation data.

<b>Project Title</b>	: Developing a conservation action plan for Forest Owlet ( <i>Heteroglaux blewitti</i> ), a Critically Endangered species endemic to central India.
<b>Investigator(s)</b>	: Dr. Shomita Mukherjee, Dr. Rajah Jayapal & Dr. V.V. Robin
<b>Researcher(s)</b>	: Mr. Pankaj Koparde - Senior Research Biologist; Ms. Aditi Neema, Ms. Zainab Khan, Mr. Kaushik Koli & Mr. Paul Anthony - Junior Research Biologists
<b>Funding Agency</b>	: Ministry of Environment, Forest & Climate Change, Government of India.
<b>Project Duration</b>	: 04.10.2017 to 03.10.2020

## **Assessment of status, distribution and threats to the population of Sarus Crane (*Antigone antigone*) in Gujarat**

- *Tejas Karmakar*

Sarus Crane (*Antigone antigone*), a resident in India, is the tallest flying bird in the world and has been classified as Vulnerable in the latest IUCN Red List. Populations of this species are reported to be declining in Southeast Asia, including its breeding locations. Gujarat is one of the strongholds of Sarus Crane, and a census conducted in January 1984 by the State Forest Department estimated the population at 19,659 individuals. In the year 2000, GEER Foundation estimated the population at 1730 individuals. Of these, 84% Sarus Cranes were sighted on the intensively cultivated plains of Kheda and Ahmedabad districts of Central and Northern Gujarat. Owing to the changes in land-use and land-cover in the region, a study on population status and the issues involving the ecology and conservation of Sarus Crane is essential.

A study is launched to assess the population, status, distribution, and effects of environmental contaminants, particularly pesticides on Sarus Crane across its breeding areas in Gujarat. Field surveys using grid-based sampling, information on pesticide usage and cropping patterns were collected. During the period under report, 23 grids of 10X10 km were covered, and 481 Sarus Cranes were sighted from Anand, Kheda, Ahmedabad and Gandhinagar districts of Gujarat. Seven Sarus Crane congregating wetlands, namely Matar, Vastana marshes, Limbasi, and agricultural fields, Vanak, Traj village pond, Bhandera lake and Rohini, were identified. Field surveys in remaining districts are in progress. To understand the agricultural practices and pesticide usage, the area was surveyed, and land cover was recorded, and locals and farmers were interviewed for information on pesticide usage. Biological samples were collected from one dead Sarus Crane in Moriya village, Ahmedabad district and sent to our laboratory, for further investigation.

<b>Project Title</b>	: Assessment of status, distribution and threats to the population of threatened Sarus Crane ( <i>Antigone antigone</i> ) in Gujarat, India.
<b>Investigator(s)</b>	: Dr. M. Mahendiran, Dr. S. Muralidharan, Dr. P. Balasubramanian & Dr. P. V. Karunakaran
<b>Researcher(s)</b>	: Ms. Apurva Madhukar Patil, Ms. Sreya Bhattacharya, Mr. Tejas Karmakar & Mr. Nikunj - Junior Research Biologists
<b>Funding Agency</b>	: Ministry of Environment, Forest & Climate Change, Government of India.
<b>Project Duration</b>	: 4. 10. 2017 to 3.10. 2019

## Assessment of status, distribution and threats to the population of Sarus Crane (*Antigone antigone*) in Uttar Pradesh

- Astha C.

According to the 1980 Asian Waterfowl Census, the largest population of Sarus Crane (*Antigone Antigone*), was recorded in Uttar Pradesh (UP). Intensively cultivated plains of Uttar Pradesh were considered as strongholds of Sarus Crane. However, over the years a steady decline of Sarus Crane population in the state was reported due to various reasons. Usage of pesticides for crop protection has also been a major concern for all taxa in recent times with Sarus Crane being no exception.

The present study assessed the population, status, distribution, and effects of pesticides on Sarus Crane across their distribution range in UP. Field surveys were conducted across the known distribution range of Sarus Crane in the state. Historic records based on questionnaire surveys, secondary data from published and online sources were collated. During the period under report, 38 grids of 10X10 km were covered and 890 Sarus Cranes were sighted from Etawah, Mainpuri, Agra, Kanpur, Sitapur and Auraiya districts. Five important Sarus Crane congregating wetlands were identified. These included the wetland near Samanpur bird Sanctuary, Ghamira wetland, Sarsai Navor wetland, Sahas wetland and Sarang jheel. Field surveys in the remaining districts are in progress. Agricultural practices and pesticide usage in the Sarus Crane congregating areas were surveyed. Locals and farmers were interviewed and information brochures were distributed for awareness. Biological samples were collected from dead Sarus Cranes each from Kurra and Nagala villages in Etawah district and sent to our laboratory, for further investigation.

<b>Project Title</b>	: Assessment of status, distribution and threats to the population of Sarus Crane ( <i>Antigone antigone</i> ) in Uttar Pradesh.
<b>Investigator(s)</b>	: Dr. M. Mahendiran, Dr. S. Muralidharan, Dr. P. Balasubramanian & Dr. P. V. Karunakaran
<b>Researcher(s)</b>	: Ms. Astha Chaudhary, Ms. Madhumita, Mr. Prakash. L, & Mr. Kartikeyen - Junior Research Biologists
<b>Funding Agency</b>	: Ministry of Environment, Forest & Climate Change, Government of India.
<b>Project Duration</b>	: 4. 10. 2017 to 3.10. 2019

## Species and habitat conservation efforts for the population recovery of the Narcondam Hornbill (*Rhyticeros narcondami*)

- Manchi Shirish S.

The Narcondam Hornbill (*Rhyticeros narcondami*) has a highly restricted distribution range in a 6.82 km<sup>2</sup> area on the isolated Narcondam Island in the Bay of Bengal, India. Our previous study estimated the population of this species at 360-380 birds during 1999 and following which management interventions were recommended to the forest department based on the threats identified. Subsequently, introduced feral goats were removed from the island to enhance habitat quality. During the survey of 2013, the Narcondam Hornbill showed a significant increase in its population i.e., ~1250-1400 individuals with a density of 190± 81 SD birds/km<sup>2</sup> and encounter rate of mean 23.32 ±.63 SD individuals/km. Presently, the species has the densest population among any other hornbill species in the world. A large proportion of the population exists below 500 m altitude, with highest density (mean = 214.44± 53.92 SD birds/km<sup>2</sup>) occurring between 200 m and 500 m. Among the 21 nests observed, 93% (N=19) were found to be successful in breeding. Most individuals in the population (84.70%) were aged between four to five years and were first and second-year breeders. Presently, threats such as the presence of introduced goats, deforestation and hunting of the species mentioned in earlier studies do not exist. Well-timed management actions by the Forest Department based on recommendations from previous studies helped in recovering the population of the Narcondam Hornbill.

<b>Project Title</b>	: Status, ecology and conservation of Narcondam Hornbill ( <i>Rhyticeros narcondami</i> ) in Narcondam Island, India.
<b>Investigator(s)</b>	: Dr. Manchi Shirish S.
<b>Researcher(s)</b>	: Nil
<b>Funding Agency</b>	: Ministry of Environment, Forest & Climate Change, Government of India.
<b>Project Duration</b>	: 11.06.2010 to 25.09.2017

## Distribution and habitat use of Black-bellied Tern (*Sterna acuticauda*) in select rivers of India

- S. Suresh marimuthu

According to Birdlife International, 2017 in India, 88 (~7.0%) species of birds have been recognised as threatened (including 16 Critically Endangered, 21 Endangered and 51 Vulnerable), considering their population numbers, trajectories and distribution range. Despite a higher proportion of threatened birds in India, except for few birds (Vultures, Bustard and Floricans), species-specific conservation plans have not been formulated for other species. It is hence essential to develop a conservation plan based on an ecological understanding of these species. We selected three Endangered species (Manipur Bush-quail *Perdicula manipurensis*, Swamp Grass-babbler *Laticilla cinerascens*, and Black-bellied Tern *Sterna acuticauda*), on which no status survey has been carried out hitherto. In the first year, we proposed to survey ten major rivers that support breeding populations of Black-bellied Tern. We surveyed four rivers viz., Bharathapuzha (Kerala), Chambal (Rajasthan and Uttar Pradesh), Mahanadhi (Odisha) and Cauvery (Tamil Nadu) using occupancy framework. We divided each river into 2 km length, with each segment forming a sampling unit. Each segment was further divided into four equal 500 m sub-units, to estimate the detection probability and occupancy of the study species. We sampled 50% of the grids for all rivers using an alternate grid sampling method. Within each grid and sub-grid, presence and absence of tern and site covariates were recorded.

Black-bellied Tern was not detected in Cauvery and Bharathapuzha rivers during our sampling. Data collected from 138 grids in Chambal and 91 grids in Mahanadhi were compiled to quantify the naïve occupancy and detection probability of Black-bellied Tern. The detection probability of Black-bellied Tern was 0.13 and 0.21 and for Chambal and Mahanadhi respectively. The naïve occupancy in Chambal was 0.27 and in Mahanadi was 0.45. Preliminary results revealed that the species occupied downstream rather than upstream areas of the rivers.

<b>Project Title</b>	: Assessing the distribution, population and habitat use of three Endangered species to develop a conservation plan for species and their habitats.
<b>Investigator(s)</b>	: Dr. S. Babu, Dr. Rajah Jayapal, Dr. H.N.Kumara & Dr. Manchi Shirish S.
<b>Researcher(s)</b>	: Mr. S. Suresh Marimuthu - Senior Research Biologist; Mr. D. Tamiliniyan, Mr. Harif Parengal & Mr. Sarbasis Dutta - Junior Research Biologists
<b>Funding Agency</b>	: Ministry of Environment, Forest & Climate Change, Government of India.
<b>Project Duration</b>	: 4. 10. 2017 to 3.10. 2020

## **Dispersal patterns of the Edible-nest Swiftlet (*Aerodramus fuciphagus*) in the Andaman Islands**

- *Prathamesh Gurjarpadhye*

To understand the dispersal patterns of the Andaman Edible-nest Swiftlet (AENS), we assessed 13 caves on Baratang Island, Andamans, India. Breeding and non-breeding populations of the AENS were estimated using nest and roost count methods. All adults in the selected colonies were captured and marked with the aluminium Z-rings during the nesting season (December-January), using mist-nets at the cave openings. Similarly, all chicks (after 30 days of hatching) were captured on the nests (March-April) from the selected caves and marked in the same way. Of the 207 adults captured in 2017, we could recapture 78% (162 individuals) in 2018. All recaptured birds were from the same caves where they were initially captured. The recapture results revealed that adult Edible-nest Swiftlets do not disperse. However, recapture of the four marked chicks during 2013 confirmed natal dispersal. Each individual was recaptured in a different cave and the distance between the marked and recaptured caves was 101.11 m, 527.55 m, 395.79 m and 462.26 m respectively. As the 192 chicks marked in 2017 will be returning to the breeding colonies only during the end of the breeding season in 2018, we will be able to recapture them during the post-monsoon period. The molecular-sexing work of collected samples for sex identification is in progress. The sex identity results would help us understand the role of the sex of an individual in natal dispersal in the Edible-nest Swiftlet on the Andaman and Nicobar Islands. Using bird morphometry and cave location data, we will also attempt to understand their role in dispersal of the species.

<b>Project Title</b>	: Understanding dispersal patterns in the monomorphic Edible-nest Swiftlet of the Andaman Islands using Biotechnological tools.
<b>Investigator(s)</b>	: Dr. Manchi Shirish S. & Dr. Ram Pratap Singh
<b>Researcher(s)</b>	: Mr. Prathamesh Gurjarpadhye - Project Fellow
<b>Funding Agency</b>	: Department of Biotechnology, Government of India.
<b>Project Duration</b>	: 04.01.2016 – 03.1.2019

## How common are our common birds? Preliminary findings from the survey of synanthropic birds in Maharashtra

- *Pallavi Arora*

Synanthropic birds, living in close association with humans in human-modified environments are regarded as indicators of changes in urban ecosystems and farmlands. It is widely believed that there has been a sharp decline in their populations across the country in recent times, particularly of House Sparrow (*Passer domesticus*) and House Crow (*Corvus splendens*). In order to assess the current status of populations of synanthropic birds of India including House Sparrow and to study their responses to urbanization and changing farm practices, we have launched a pan-India survey of bird populations in human-modified environments.

The entire country was classified into 20 eco-climatic regions, which were divided into 2X2 km grids. Grids for field surveys were identified by random sampling in a way such that each eco-climatic region was covered in proportion to its geographical area. Birds were censused in each selected grid-cell using five variable-width circular plots. Measures of land use pattern and urbanization including human population density, land cover types, signs of livestock presence, kinds of built-up areas with roof types (as nest substrate availability), degree of civic sanitation, number of telecommunication towers, presence of major industrial units, and road network density were quantified in each sampled grid-cell. We also conducted questionnaire surveys among the local communities to ascertain their view points on the perceived decline of common birds and its potential causes.

The preliminary findings of our survey from Maharashtra, where a total of 299 grids have been sampled during March-July 2018 are discussed.

<b>Project Title</b>	: Assessing the population status of synanthropic bird species of India, including House Sparrow and House Crow, and their response to urbanization.
<b>Investigator(s)</b>	: Dr. Rajah Jayapal & Dr. S. Babu
<b>Researcher(s)</b>	: Ms. Debanjana Basu, Mr. C.P. Ashwin, Ms. Pallavi Arora, Ms. Priyanka Ram Bansode, Mr. Darshan Vinod Potdar, Ms. S. Priyadarshini, Ms. Abhisikta Roy & Mr. Golusu Babu Rao - Junior Research Biologists
<b>Funding Agency</b>	: Ministry of Environment, Forest & Climate Change, Government of India.
<b>Project Duration</b>	: 4. 10. 2017 to 3.10. 2021

## Addressing large carnivore conflict at the human-wildlife interface in the Western Ghats part of Tamil Nadu

- V. Gayathri

Human-large mammal conflict invariably results in negative perceptions of wildlife by local communities, subsequently leading to retaliatory killing. The local communities tend to develop hostility towards any conservation initiatives in high conflict areas and thus large mammal populations are under decline due to anthropogenic factors such as loss of habitat, poaching, and retaliatory killing. It is imperative to ascertain the drivers of conflict and develop mitigation measures to conserve species involved in conflict. We overlaid 5 x 5 km<sup>2</sup> sampling grids covering Protected Areas (PAs) and non-PAs, and its 5 km buffer areas to achieve spatially independent sampling due to the wide-ranging behaviour of large mammals. We conducted semi-structured questionnaire interviews (n = 297) with locals with respect to human-large mammal conflicts, from November 2017 to July 2018, and sampled at least four households for each sampling grid. Maximum conflict incidents were recorded for elephant *Elephas maximus* (39%) and leopard *Panthera pardus* (35%), followed by sloth bear *Melursus ursinus* (7.5%), dhole *Cuon alpinus* (7.5%) gaur *Bos gaurus* (7%) and tiger *Panthera tigris* (4%). The study revealed that leopards are one of the primary carnivores responsible for livestock depredation, particularly goat, sheep and domestic dogs when unattended. Stringent measures to curb illegal grazing inside PAs and improved livestock management practices could reduce the probability of livestock depredation. Leopard conflict was much higher in the fringe habitats, in proximity to PAs as large number of livestock share the same water sources with other wildlife and graze illegally. Illegal grazing might reduce the food source availability and potentially transmit diseases to wild ungulates. Establishing human-large carnivore conflict patterns across socio-cultural gradients helps policy makers to formulate management plans and develop effective mitigation measures to reduce conflict.

<b>Project Title</b>	: Assessing anthropogenic threats to large carnivore population in the Western Ghats part of Tamil Nadu.
<b>Investigator(s)</b>	: Dr. T. Ramesh
<b>Researcher(s)</b>	: V. Gayathri - Project Fellow
<b>Funding Agency</b>	: Department of Science & Technology (Science and Engineering Research Board –SERB), Government of India.
<b>Project Duration</b>	: 08. 03. 2017 to 07. 03. 2022

## Bird communities in and around select Indian civil airfields

- *Pramod P.*

The study on the bird hazards to aircrafts in three selected civil airfields was initiated in October 2017. After obtaining permits, the field study was initiated in March April 2018. The study areas selected were Coimbatore International Airport, Tamil Nadu, Sardar Vallabhbhai Patel International Airport (SVPIA), Ahmadabad, Gujarat (both are operational), and the Kannur International Airport, Kerala which is yet to become operational. A comprehensive methodology from a landscape perspective was formulated for studying the bird community on the airfields. The sampling strategy included data collection from 10 sq. km around the runway of the airport with an increasing intensity of sampling towards the runway. Observation includes 160 point-counts around, and 20 transect counts near the runway. Analysis of the data showed that the bird community within an airport depends on larger landscape features in and around the airport. Though a large number of bird species (66, 71 and 122 in Ahmadabad, Coimbatore and Kannur respectively) are recorded from each airport, only few have significant population numbers to raise potential threat to an aircraft. Both the functioning airports have a predominance of some identified bird species that pose a threat to aircraft, due to the availability of some specific ecological niches in and around the airports. Management of these supporting factors is critical for mitigation of bird hazards in these airports.

<b>Project Title</b>	: A study on bird hazards in select Indian civil airfields.
<b>Investigator(s)</b>	: Dr. P. Pramod & Dr. P.V.Karunakaran
<b>Researcher(s)</b>	: Ms. Anjel Joy, Ms. Binisha B., Mr. Anees Khan & Jeevith S. - Junior Research Biologists
<b>Funding Agency</b>	: Ministry of Environment, Forest & Climate Change, Government of India.
<b>Project Duration</b>	: 04.10.2017 to 03.10.2019

## Habitat use and human-elephant interactions in south West Bengal

- *Aakriti Singh*

We selected an elephant herd with a size of 10 individuals to study their movement and habitat use at Rupnarayan Forest Division in southern West Bengal. We overlaid grid cells of 2 X 2 km on the entire landscape and considered these grid cells as the smallest unit to understand the intensity of habitat use by elephants. Data from six months (August 2017 and January 2018) showed that the focal herd intensively used 23 grid cells of the 96 grid cells (384 km<sup>2</sup>) covered. A drive of elephants by an organized team of people with a fire-torch is known as Hula-drive, which often is practiced in the study site to drive the elephants that often decide their movement pattern and habitat use. The path lengths of elephants were significantly higher during the Hula-drive than in the drive-by locals and the natural elephant movement ( $F_{2,77}=38.35$ ,  $p < 0.01$ ). Human-elephant conflict refers to a range of direct and indirect interactions between humans and elephants that potentially harm both. We verified 200 human casualties in Bankura North, Bankura South, Purulia, Panchet, Midnapore, Kharagpur and Rupnarayan Forest Divisions reportedly done by wild elephants. Maximum human deaths happened between 0300 and 0600 hours during January to May, when people went for open defecation or moved through forest areas including plantations and adjoining agricultural fields. A comparison between years showed a similar pattern of circumstances leading to human death as well as in the seasons and months in which the human deaths occurred. A low availability of food resources in the forest owing to monoculture plantations and highly fragmented forest patches, drive the elephants to agriculture areas for sustenance. This has perhaps led to high human-elephant interaction and conflict that has resulted in the highest number of human deaths anywhere in the country.

<b>Project Title</b>	: Ecology of elephant ( <i>Elephas maximus</i> ) in south-West Bengal including population dynamics, migratory pattern, feeding habits and human-elephant conflict.
<b>Investigator(s)</b>	: Dr. H.N. Kumara & Dr. P.A. Azeez
<b>Researcher(s)</b>	: Ms. Aakriti Singh – Research Fellow
<b>Funding Agency</b>	: West Bengal Forest & Biodiversity Conservation Society.
<b>Project Duration</b>	: 01.04.2016 to 31.03.2019

## Conservation of the Andaman Serpent-eagle *Spilornis elgini* in the Andaman Islands: Phase-I

- *Manchi Shirish S.*

The objectives of the study were to estimate the population, abundance and distribution of the endemic Andaman Serpent Eagle (ASE) *Spilornis elgini* and identify potential threats to the species. We conducted the occupancy survey on the islands with >100 km<sup>2</sup> area, using grid sampling method (5 km X 5 km cell size). Occupancy-Abundance Model estimated Naïve Occupancy ( $\Psi$ )=0.83 (SD=0.16) for ASE with the detection probability (P)=0.8 (SD=0.16) indicating that the species occupied more than 80% of the total area surveyed. Also, the model estimated the occupancy-abundance of the species as 4.4 individuals per cell of 25 km<sup>2</sup>, indicating the density of 4 to 5 individuals in each 25 km<sup>2</sup> cell surveyed. The Habitat-Occupancy Model depicted low dependency of ASE on the habitat ( $R^2=0.35$ ). However, this known island forest species is found to be exclusively nesting (n=3) in the Mangrove forest. The Single-Season Two Species Model estimation showed that the crested serpent eagle (CSE) *Spilornis cheela* (Naïve Occupancy=0.78) occupied 78% of the landscape surveyed and the endemic ASE (Naïve Occupancy=0.22) occupied the remaining 22% of the area. While assessing the competition across landscape between these two species, the model estimated their co-occurrence ( $\phi$ ) value of 0.358, suggesting 30% possibility of these species occurring together. The frequent killing of poultry of the local people by the ASE resulted in Raptor-Human Conflict. Around 68.75% (N=112) people, residing in and around the forest reported this problem. The Raptor-Human Conflict was the primary reason for people (66.07%) found hunting raptors to save their poultry. Living in the hamlets inside the forest was found to be a suitable condition for hunting activities ( $\chi^2=21.975$ ,  $P<0.05$ ) as people in these areas were more involved in the hunting of raptors. People were using Air gun, bird traps and Catapult to hunt the raptors. However, they mostly used Air guns (41.69%), followed by bird traps (33.33%). An awareness program for the local people is recommended for the conservation of raptors in the Islands to mitigate the conflicts.

<b>Project Title</b>	: Conservation of the Andaman Serpent-eagle <i>Spilornis elgini</i> in the Andaman Islands: Phase-I.
<b>Investigator(s)</b>	: Dr. Manchi Shirish S.
<b>Researcher(s)</b>	: Ms. Shivkumari Patel - Junior Research Fellow
<b>Funding Agency</b>	: Raptor Research & Conservation Foundation, Mumbai.
<b>Project Duration</b>	: 29.12.2014 to 30.06.2017

## An ecological impact of windmills on wildlife in Karnataka

- *H. N. Kumara*

Windmills cause three major potential risks to birds and animals, (1) direct loss of habitat through construction of wind farms and their associated infrastructures, (2) displacement of birds and animals in response to the construction of wind farms, and (3) collision with rotor blades and other structures leading to death or injuries to the animals. Some regions of Karnataka have high suitability for wind farms, and many windmills have already been established. Considering ecological issues and the density of windmills, we conducted a study at Chitradurga and Gadag districts. A year-round monitoring of windmills was conducted to assess bird diversity in the sites and estimate the collision rate of birds and animals. We recorded 208 and 189 species of birds from Chitradurga (VV Sagar, Jogimatti and Chalkere hills and four wetlands) and Gadag districts (Kappadagudda and Papanasi and four wetlands) respectively, which represent nearly 36 - 40% of Karnataka's bird diversity. We recorded collisions of 10 animals (six bat species and four birds), resulting in a collision rate of 0.23/windmill/year. Our review suggests that the collision rate in Karnataka is lower than many other locations in the country. Globally, the collision rate calculated for different windmill sites range from zero in the cornfields of Friedrich –Wilhelm-Lubke-Koogin, Germany to two in Zeebrugge in Belgium. Although the collision rate in Karnataka appears to be on the lower side, it cannot be ignored since many collisions happened in a short span of time, during the post-monsoon period. The study on mammals using camera-traps in Kappadagudda, revealed an avoidance of windmills, especially old windmills, by a few species. Such avoidance and movement to fringes might increase conflict with humans. This calls for a set of protocols and policy guidelines before diverting forest land for wind farms.

<b>Project Title</b>	: A comprehensive study of the potential ecological impacts of windmill farms on wildlife with special emphasis to avifauna in Karnataka.
<b>Investigator(s)</b>	: Dr. H.N. Kumara, Dr. S. Babu & Dr. P.V. Karunakaran
<b>Researcher(s)</b>	: Mr. Mahesh D. Bilaskar – Senior Research Fellow; Mr. G. Babu Rao, Ms. Malyasri Bhattacharya, Mr. Harif Parengal, Mr. D.Tamiliniyan, Mr. D. Deepak, Ms. Athira Balakrishnan, Mr. Santanu Mahato and - Junior Research Fellows
<b>Funding Agency</b>	: Karnataka Forest Department, Karnataka Renewable Energy Development Limited & National Institute of Wind Energy.
<b>Project Duration</b>	: 31.07.2016 to 30.06.2018

## Mapping the subterranean fauna in the limestone caves of the tropical islands of India

- *Dhanusha Kawalkar & Amruta Dhamorikar*

We conducted a preliminary survey to understand and describe the morphology and biodiversity of seven selected caves on the Baratang Island, North and Middle Andaman Islands. For the morphometric measurements, we used Leica Distometer (DistoS910) and generated maps of the caves using QGIS 2.14.12 and WINKARST software. We laid survey stations at every 1m distance for cave morphometry. To assess the biodiversity in caves, we used belt transects and quadrat methods. Around 536.30 m<sup>2</sup> (89.38±55.82 SD) and 127.44 m<sup>2</sup> (21.24±12.7 SD) area was surveyed by transect and quadrat method respectively. Pattern morphometric indices depicted that one cave is vertical and six are horizontal. The average plan length of the caves surveyed is 21.08 ±10.13 SD m whereas, the real length estimated is 22.17±9.10 SD m. The average area, perimeter and volume of the caves are 320.65±266.53 SD m<sup>2</sup>, 89.48±47.18 SD m and 16268.91±22525.67 SD m<sup>3</sup>, respectively. We also estimated negative drop (D<sub>n</sub>)=14.40±12.79 SD m, positive drop (D<sub>p</sub>)=18.83±9.23 SD m and vertical range (R<sub>v</sub>)=33.23±20.78 SD m of the cave. The average area/perimeter ratio is 3.04±0.29 SD and entrance width/interior width ratio is 0.55±0.27 SD of the caves. We encountered 46 species of invertebrates in the surveyed caves. Transect survey yielded a higher number of invertebrate species (n=35) as compared to the quadrats (n=31) with Arachnida as the most diverse group (n=14). The most abundantly distributed group was crickets (40% in transect and 29% in quadrats). The other fauna recorded were beetles, bugs, crustaceans and moths. Further work on mapping and conservation of the subterranean habitats is in progress.

<b>Project Title</b>	: <i>In-situ</i> and <i>ex-situ</i> conservation of endemic Andaman Edible-nest Swiftlet in Andaman and Nicobar Islands.
<b>Investigator(s)</b>	: Dr. Manchi Shirish S.
<b>Researcher(s)</b>	: Ms. Dhanusha Kawalkar, Ms. Amruta Dhamorikar, & Deepika Chetri Junior Research Biologists
<b>Funding Agency</b>	: Ministry of Environment, Forest & Climate Change, Government of India.
<b>Project Duration</b>	: 04.10.2017 to 03.10.2022

## **Bird-habitat associations in Jhilmil Jheel Conservation Reserve, Uttarakhand: Towards developing a conservation plan for the IBA**

- *Ankita Das*

Important Bird & Biodiversity Areas (IBAs) are a network of sites, which are exceptionally rich in birds and other taxa and hold significant populations of rare, endemic, and threatened species. However, biodiversity of many IBAs remain under-documented. To fill this gap in critical knowledge, we have embarked on a study that aims to document the biodiversity and habitat values of select IBAs including Jhilmil Jheel Conservation Reserve (CR) in Uttarakhand, with particular focus on birds.

Jhilmil Jheel CR was designated as an IBA for its remnant patches of riverine grasslands and the swamp deer populations. These riverine habitats are also rich in grassland avifauna. As part of biodiversity documentation to develop a conservation plan for this IBA, we studied the bird-habitat associations during March-July 2018.

The Jhilmil Jheel IBA was divided into five distinct habitats viz., grassland, mixed forest, riverine forest, scrub jungle, and *Eucalyptus* plantation. Bird populations were sampled using variable width circular plots and in total, 37 points each with three to four temporal replicates, were undertaken in all the habitats. Habitat variables including tree species richness, tree species diversity, girth at breast height, percent canopy cover, invasive species diversity, percent grass cover, and human disturbance were quantified using 10 X 10 m standard vegetation plots laid at random, in proportion to the total area of the habitat type.

The relationships between birds and habitat parameters were analyzed using non-parametric tests including correlation and association tests, and preliminary findings are presented here.

<b>Project Title</b>	: Developing conservation and management plans for select Important Bird and Biodiversity Areas (IBAs) of the country.
<b>Investigator(s)</b>	: Dr. Rajah Jayapal, Dr. S. Babu & Dr. P.R. Arun
<b>Researcher(s)</b>	: Ms. Ankita Das, Mr. Clinice P. Jose, Ms. R.K. Niveditha & Ms. Suryamol Sukumaran – Junior Research Biologists
<b>Funding Agency</b>	: Ministry of Environment, Forest & Climate Change, Government of India.
<b>Project Duration</b>	: 04.10.2017 to 03.10.2020

## **A Study on small cats in Sanjay Gandhi National Park, Mumbai through volunteer participation**

- *Shomita Mukherjee*

Mumbai's Sanjay Gandhi National Park (SGNP), spread over an area of 104 km<sup>2</sup>, is often referred to as the green lungs of the city. This serves as a popular recreational area for denizens of the city and harbors substantial biodiversity. Citizens of Mumbai from various walks of life are interested in volunteering their time and effort to help generate crucial information on various aspects of the biodiversity of SGNP. Two species of small cats, Jungle Cat (*Felis chaus*) and Rusty-spotted Cat (*Prionailurus rubiginosus*) are known to occur here, though their distributions and habitat requirements within the Park are not clear. The aim of the project is to conduct a survey for small cats in SGNP and surrounding areas with the help of volunteers from the city.

A total of 40 volunteers from various walks of life, along with some forest staff, were trained in locating and collecting scats, using handheld GPS units, setting up camera traps, monitoring water bodies and streams, using android applications to monitor vegetation cover and the fundamentals of GIS applications. Following this, volunteers met over weekends and collected scat samples and associated habitat data from various parts of the Park. In total, 112 scats were collected and brought to the laboratory at SACON for diet analysis. Results from 79 scats, visually identified as those of small cats, showed a predominance of rodents in their diet (non-parametric Bootstrap mean: 82% scats, 95% CI: 70% - 89%). Results from DNA sequences, revealed Rusty-spotted Cat presence in the Yeur and Tulsi ranges of the Park. These scats were found in open, rocky patches, indicating that rocky areas with low canopy cover form part of the habitat of the species.

<b>Project Title</b>	: Survey for small cats in Sanjay Gandhi National Park, Mumbai.
<b>Investigator(s)</b>	: Dr. Shomita Mukherjee, Dr. P. V. Karunakaran & Mr. Nayan Khanolkar
<b>Researcher(s)</b>	: Conducted through volunteer participation
<b>Funding Agency</b>	: Maharashtra Forest Department
<b>Project Duration</b>	: 30.03.2017 to 30.09.2018

## **Identifying Indian cavity nesters most vulnerable to the loss of large trees: An experimental setup**

- *Manchi Shirish S.*

We aimed to study competitive relationships among secondary users of cavities in large trees, with a focus on birds. The objective was to identify the secondary cavity-nesting birds vulnerable to loss of large trees. To examine competition, we provided nest boxes of two different sizes as alternate nesting sites. Considering the territorial behaviour of different cavity-nesting species, we placed the boxes in various combinations (trios = 3 boxes, 30 meters away from each other, pairs = 2 boxes, 30 meters away from each other and a single box). The combinations were at least 300 meters away from each other. Each box is visited once in 15 days to record its status of occupancy. Thus far, we placed 102 nest boxes close to different habitats *viz.* deciduous, evergreen, and semi-evergreen forests in the southern part of Western Ghats. We lost ten boxes to theft after installation at different sites. From the 92 boxes, 48% are currently occupied by birds, mammals and insects. Of the total nest-boxes in use, honeybees (*Apis* spp.) occupied most (35.42%), followed by birds (four species - Spotted Owlet (*Athene Brahma*), Common Myna (*Acridotheres tristis*), Malabar Grey-Hornbill (*Ocyrceros griseus*) and Indian Roller (*Coracias benghalensis*) (31.25%) and Three-striped Palm Squirrel (*Funambulus palmarum*) (25%). Squirrels occupied boxes at places close to deciduous forests. Honeybees occupied a higher proportion of boxes in the evergreen and semi-evergreen forest. However, birds of different species were seen occupying a similar percentage of boxes in all the habitats.

<b>Project Title</b>	: Identifying Indian cavity nesters most vulnerable to the loss of large trees.
<b>Investigator(s)</b>	: Dr. Mark Stanback & Dr. Manchi Shirish S.
<b>Researcher(s)</b>	: Nil
<b>Funding Agency</b>	: National Geographic Society, USA.
<b>Project Duration</b>	: 22.12.2014 to 31.10.2018

## Ecological investigations and conservation strategies of select endemic tree species in the forests of Western Ghats, Tamil Nadu

- *C. Muthumperumal*

The ongoing project is an ecological investigation of select endemic plant species distributed in Tamil Nadu part of the Western Ghats. The objectives of this study are to identify the extended distribution range of the species, its population status, phenology, pollinators, seed dispersers and site disturbances to propose conservation strategies. All the study species under investigation are included in the IUCN Red List. Among five endemic species, viz. *Wendlandia angustifolia*, *Memecylon flavescens*, *Syzygium densiflorum* and *Syzygium microphyllum* and *Eugenia rotteriana*, the first four have been studied so far. Of the four species studied, two species viz. *W. angustifolia* and *S. microphyllum* are distributed in Kalakkad Mundanthurai Tiger Reserve and two (*M. flavescens*, *S. densiflorum*) in Nilgiri Division, Tamil Nadu.

One of the study species, *W. angustifolia* Wight ex. Hook.f. (Rubiaceae) is categorized as Extinct in the IUCN Red List. A detailed study was carried out in and around known distribution localities to assess the status of the species. A total of 93 quadrats (each measuring 0.1 ha area) were laid in Kalakkad-Mundanthurai Tiger Reserve to gather data on this species and other associated plant taxa. A total of 2676 individuals belonging to 131 plant species were enumerated. A population of 1091 individuals of the study species was recorded. Observations on pollinator visits to *W. angustifolia* showed that flies contributed 35% of visits, followed by bees (25%), wasps (24%) and butterflies (16%). Dusty seeds (minute) were facilitated for water and wind dispersal. Stem cuttings and air layering technique were tried to develop saplings. A molecular barcode of this species was developed and submitted to GenBank, National Center for Biotechnology Information.

<b>Project Title</b>	: Ecological investigations on select endemic trees and their conservation strategies in the forests of Tamil Nadu.
<b>Investigator(s)</b>	: Dr. C. Muthumperumal & Dr. P. Balasubramanian
<b>Researcher(s)</b>	: C. Muthumperumal, SERB-Young Scientist
<b>Funding Agency</b>	: Department of Science & Technology (DST-SERB), Govt. of India.
<b>Project Duration</b>	: 28.03.2016 to 27.03.2019

## Macro and micro-characteristics of feathers of Indian Pitta (*Pitta brachyura*): A pilot study for making feather catalogue

- Prateek Dey & Swapna Devi Ray

Feathers, the most distinctive feature of birds, provide insulation for controlling body temperature, aerodynamic power for flight, and colours for communication and camouflage. Individual feathers vary among species in size, shape, colour and microstructure which provides a basis for species identification. We conducted a systematic study to prepare a feather catalogue for Indian pitta (*Pitta brachyuran*), a passerine bird native to the Indian subcontinent. Barring the filoplume, all other five types of feathers, from Indian Pitta were retrieved from a carcass for this study. A total of 17 feathers, three from each type except bristle (5 feathers), were used for microslide preparation (total 185 microslides) and observed under a light-microscope. Flight feathers were the largest ( $80 \pm 3.29$  SE mm) in size, whereas bristle feathers were the smallest ( $3.35 \pm 0.08$  SE mm). The average feather barb length was the longest in body contour ( $8.97 \pm 0.56$  SE mm) followed by flight contour ( $8.76 \pm 1.88$  SE mm), down ( $7.06 \pm 3.04$  SE mm), semiplume ( $7.07 \pm 2.18$  SE mm), powder down ( $6.21 \pm 1.91$  SE mm) and bristle ( $3.35 \pm 0.08$  SE mm). Length of barbules was highest in semiplume ( $2.32 \pm 0.032$  SE mm) and lowest in contour ( $0.92 \pm 0.039$  SE mm). Microscopic examination revealed the presence of knobbed villi in contour feathers, whereas other feather types were devoid of villi. Subpennaceous region was present in contour and semiplume feathers were absent in other feather types. The nodes in contour feathers were short and flat with irregular light brown pigment as compared to other feather types (except bristle) where nodes were relatively large (flared) distally, diminishing to minute nodes proximally with dark brown pigment. The internodes of contour feathers were short and irregular with light brown pigment as compared to other feather types (except bristle) where internodes were long and flat, with similar pigmentation. Large asymmetric prongs were exclusively present in contour feathers. On the opposite side of prongs, there were hooklets, unique to contour feathers. The results demonstrate that contour feather microstructure can aid in avian forensic studies

<b>Project Title</b>	: Establishment of National Avian Forensic Laboratory at SACON for national certification for illegal trafficking of birds.
<b>Investigator(s)</b>	: Dr. Ram Pratap Singh & Dr. P. Pramod
<b>Researcher(s)</b>	: Dr. S. K. Sharma - Project Scientist; Ms. Swapna Devi Ray & Mr. Prateek Dey - Junior Research Biologists
<b>Funding Agency</b>	: Ministry of Environment, Forest & Climate Change, Govt. of India.
<b>Project Duration</b>	: 04.10.2017 – 03.10.2020

## **Characterization of Community Reserves and assessment of their conservation values in Meghalaya**

- *P.V. Karunakaran*

Community Reserves (CRs) are those reserves where the community or an individual has volunteered to conserve wildlife and its habitat. The Government declares such private or community land to be included within the Protected Area network, for protecting fauna, flora and traditional or cultural conservation values and practices. Since the amendment of the Wildlife (Protection) Act 1972 in 2002, 45 CRs have been declared in India, of which 41 are notified in Meghalaya alone, which is among the four biodiversity hotspots of the country. It would be interesting to study the impact of such a concentration of CRs (>90%) from biological, social and cultural perspectives. Hence, a multi-factor study to characterise and assess the conservation value of the CRs in Meghalaya was developed. The objectives of the project are to, (i) identify, characterize and map the landscape elements and its components (flowering plants, mammals, birds, and herpetofauna) within each CR, and assess its conservation values, based on identified biological, social and cultural attributes (criteria), (ii) identify and characterise the key community institutions and other stakeholders who have a crucial role in the current system of natural resource management in CR, (iii) conduct an analysis of various management issues/threats/challenges related to conservation and livelihood opportunities along with its intensity and spatial occurrence, and (iv) develop a comprehensive conservation plan in consultation with the local communities for each CR. The methods include preparation of spatial database on all the CRs with themes such as landuse, landcover, drainage, assessment of key elements of biodiversity (flowering plants, mammals, birds, and herpetofauna) and social and cultural aspects. The collected information will be integrated and analysed (overlay analysis) on a spatial platform to prepare a spatial CR model (SCM) to assess the conservation value of the CR.

<b>Project Title</b>	: Characterisation of Community Reserves and assessment of their conservation values in Meghalaya.
<b>Investigator(s)</b>	: Dr. P.V. Karunakaran, Dr. H.N. Kumara & Dr. S. Babu
<b>Researcher(s)</b>	: Ms. Tremie M. Sangma, Ms. Hima Hariharan, Mr. Karthik P., Mr. Adrian Lyngdoh, & Mr. Andrew R. Marak
<b>Funding Agency</b>	: National Mission on Himalayan Studies (NMHS), Ministry of Environment, Forest & Climate Change, Government of India.
<b>Project Duration</b>	: 01.04.2018 to 31.03.2021

## Surveillance and monitoring of impact of environmental contaminants on birds in India

- V. Bhagyasree

It is adequately clear that environmental contaminants have contributed to population decline in many species of birds in India. However, current surveillance and monitoring programmes are inadequate. Under this context a project has been initiated. While surveillance on bird mortality will be done across the country, an intensive study, particularly on the levels of Persistent Organic Pollutants (POPs), is being planned in Odisha and Andhra Pradesh.

During the past nine months, seven incidents of mass mortality have been reported in the country. Among these, mortality of Spot-billed Pelican (Karnataka), Eurasian Collared Dove (Rajasthan) and Baya Weaver (Tamil Nadu) were attended to. While nematode infestation is said to be responsible for Pelican death, investigation on Eurasian Collared Dove and Baya Weaver are underway. Further, about 160 dead individuals comprising 40 species of birds have been received from seven states, namely Gujarat, Karnataka, Maharashtra, Odisha, Rajasthan, Tamil Nadu and Uttar Pradesh. The intensive study in Odisha has been initiated and surveys on agricultural and industrial activities have been carried out in eight districts, namely Gajapati, Ganjam, Khordha, Koraput, Malkhangiri, Nayagarh, Puri and Rayagada. Information on agricultural practices, cropping pattern, pesticides used, major water sources and drainage pattern has been compiled. Industrial activities and other environmental disturbances have been collated.

Wherever dead birds were reported, intensive field surveys were conducted, to gather circumstantial evidence. Birds were subjected to post-mortem, and samples of tissues and feathers were collected and preserved for documenting levels of contaminants, such as pesticides, heavy metals, pharmaceuticals, and poly-aromatic hydrocarbons. Standard protocols will be followed for identifying and quantifying contaminants.

<b>Project Title</b>	: National Centre for surveillance and monitoring of impact of environmental contaminants on ecosystem components with special focus to birds in India.
<b>Investigator(s)</b>	: Dr. S. Muralidharan
<b>Researcher(s)</b>	: Mr. K. Nambirajan – Project Associate; Ms. V. Kirubhanandhini & Ms. V. Bhagyasree - Junior Research Biologists; Mr. A. Kaja Maideen - Technical Assistant
<b>Funding Agency</b>	: Ministry of Environment, Forest & Climate Change, Government of India.
<b>Project Duration</b>	: 04.10.2017 to 03.10.2020

## Diversity of Odonata and alien invasive flora in select wetlands of Tamil Nadu

- Siva T. and Arul Raj S

Wetlands are recognised for their vital role in nature and natural processes, being the highest producers of biomass as compared to other ecosystems. Tamil Nadu is among the water starved states with 6.92% of its landmass categorised as wetlands in the 2011 National Wetland Atlas. With increasing unsustainable use, management of these natural resources is a necessity. The Wetland (Conservation and Management) Rules 2010 and amendments in 2017 mandate the preparation of a brief document including biodiversity of wetlands, for prioritization and conservation.

To prioritize wetlands in Tamil Nadu we surveyed 80 wetlands across the 32 districts during November 2017 to April 2018. We followed a standardised sampling protocol restricting our surveys to an hour at each wetland. Our sampling time period was between 0630 hours and 1830 hours, during which we documented a variety of biota. Here we present the diversity and distribution of odonate fauna and alien invasive flora. While, the invasive plants are known to alter the character of the wetlands, Odonata are sensitive to changes in landscape and are reliable indicators of wetland health.

Of the 80 wetlands, nine were eutrophic, 39 mesotrophic, 21 oligotrophic and 11 entirely dry. We recorded 399 species of aquatic and terrestrial vegetation, including 37 invasive alien plants, six of which were aquatic species, with *Eichornia crassipes*, *Ipomoea carnea* and *Typha angustifolia* being the most widely distributed plant species. Among the fauna, Odonata diversity comprised of two families of dragonflies (17 species) and damselflies (10 species). We recorded 14 odonate species around Eutrophic wetlands, 22 species around mesotrophic wetlands, 18 species around Oligotrophic and only 10 species along dried out wetlands. *Diplacodes trivialis* and *Orthetrum sabina* were the most commonly sighted dragonfly and damselfly species respectively.

<b>Project Title</b>	: Criteria for wetland prioritization and framework for wetland monitoring in Tamil Nadu.
<b>Investigator(s)</b>	: Dr. Goldin Quadros & Dr. Mahendiran Mylswamy
<b>Researcher(s)</b>	: Mr. T. Siva, Mr. S. Sathyamoorthy & Mr. S. Arul Raj - Project Fellow
<b>Funding Agency</b>	: State Planning Commission – Tamil Nadu State Landuse Research Board, Government of Tamil Nadu.
<b>Project Duration</b>	: 01.11.2017 to 30.10. 2018

## Polycyclic Aromatic Hydrocarbon (PAHs) contamination in Palikaranai wetland, Chennai: fish as an indicator

- *Mythreyi Devarajan*

Human civilization has been closely associated with water resources, but unfortunately this has often resulted in contamination of these resources. Pallikaranai, a wetland in Chennai provides a suitable habitat for many organisms. However, it also happens to be the drain basin of waste for entire south Chennai and the impact of urban waste on organisms inhabiting this wetland is pertinent. Of all the contaminants, Polycyclic Aromatic Hydrocarbons (PAHs) are ubiquitous, and are persistent organic pollutants of the aquatic environment. Their low biodegradability has led to accumulation in organisms. Hence, a study was initiated with the following objectives: 1) Assess the PAH residues and document the variation in magnitude of contamination in select species of fish in Pallikaranai and 2) assess the suitability of fishes for human consumption.

Samples of fishes are collected seasonally with the help of fishermen. Standard protocol was followed for sediment sample collection. QuEChERS method was used for extraction of PAHs. High Performance Liquid Chromatograph was used for quantification of PAH residues.

Five cycles of samples from January 2017 to August 2018 resulted in collection of 400 individuals from six species of fish. Fishes were necropsied to harvest tissues of interest. Results obtained so far indicate that naphthalene was the maximally detected residue and present in all species of fish. Similarly, Phenanthrene was detected in all individuals analyzed. Anthracene, Fluorene, Pyrene and Chrysene were detected in low concentrations only in a few individuals. Absence or trace levels of certain PAHs (Benzo(a)anthracene, Benzo(a)pyrene, Benzo(e)acenaphthene, Benzo(k)fluoranthene, Dibenzo(a,h)anthracene, Indeno(1,2,3-cd)pyrene and Benzo(g,h,i)pyrene) in fish muscles may be attributed to their rapid depuration and/or biotransformation.

The results obtained till date indicate that the indiscriminate exploitation of the wetland has considerable impact on different fish species of this marsh.

<b>Project Title</b>	: Polycyclic Aromatic Hydrocarbons (PAHs) contamination in Palikaranai wetland, Chennai; Fish as an indicator.
<b>Investigator(s)</b>	: Dr. S. Muralidharan
<b>Researcher(s)</b>	: Ms. Mythreyi Devarajan – DST- INSPIRE Senior Research Fellow
<b>Funding Agency</b>	: Department of Science & Technology, Government of India.
<b>Project Duration</b>	: 20.02.2015 to 19.02.2018

## **Distribution and ecological characterization of pitlakes in coal fields region of eastern India**

- *Santanu Gupta*

Lakes are crucial features on earth, but recent investigations on aquatic systems have demonstrated a continual decline in aquatic habitats and species across the world. Open cast surface mining process creates a unique aquatic ecosystem in the form of Pitlakes. These lakes have unique bathymetries, are often strongly wind sheltered and have very small catchments.

The pitlake inventory (PCFR I, II & III) to collect relevant data on pit lakes was carried out during April 2017 to March 2018, and a total of 102 pitlakes were identified from coal mining areas distributed across West Bengal and Jharkhand. The total area (open water) of pitlakes (LOWA) occupied by these aquatic systems are estimated at >400 ha, during the present study. The study indicated a higher concentration of urban/suburban presence around pitlakes in the western sector, while in the eastern sector a scattered built-up pattern indicated a more rural setting. Results also implied that the Wetlands (Conservation and Management) Rules, (2010) have been violated in a few pitlakes, more specifically section 4 subsection 1. (v), by unregulated coal ash waste dumping from nearby thermal power plants / industries. These could potentially impact biodiversity, (e.g. waterfowl) as well as the natural ecosystem functioning of these lakes. However, these pitlakes are not included in the recent Wetlands (Conservation and Management) Rules (2017). Consequently, conservation and protection of these systems now require alternate provisions within the NPCA (National Plan for Conservation of Aquatic Systems) and should be considered urgently.

<b>Project Title</b>	: Ecological exploration and socioeconomic valuation of pitlakes in Eastern Coal Fields, India: implications for conservation and sustainable use.
<b>Investigator(s)</b>	: Dr. Santanu Gupta
<b>Researcher(s)</b>	: Dr. Aparajita Mukherjee & Mr. A. Naik – Project Fellows
<b>Funding Agency</b>	: Department of Science & Technology, Government of India.
<b>Project Duration</b>	: 01.04.2017 to 31.03.2018