

Annual Report **2014-15**



Sálim Ali Centre for Ornithology and Natural History

Published by

The Director

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1896 - 1987

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Background

Sálim Ali Centre for Ornithology and Natural History (SACON) was established in 1990, as a centre of excellence, under the Ministry of Environment and Forest and Climate Change (MoEF&CC), Government of India. The SACON Society, presided by the Honorable Minister for Environment and Forest & Climate Change (Government of India), is the apex body of SACON and the management of SACON is vested in the Governing Council, chaired by the Secretary to the Government of India, MoEF & CC. Realizing the significance of holistic approach in avian studies and conservation, the major objectives of SACON have been designed to cover the entire field of natural history focusing on ornithology.

Mission

“To help conserve India's biodiversity and its sustainable use through research, education and people's participation, with birds at the centre stage”



Objectives

Design and conduct research in ornithology, covering all aspects of biodiversity and natural history.

Develop and conduct regular courses in ornithology and natural history at the level of M Sc., M Phil., and Ph.D. and also short-term orientation courses in related subjects.

Create a data bank on Indian ornithology and natural history, and disseminate knowledge relating to ornithology and natural history for the benefit of the community.

Executive Summary

During 2014-15, SACON has undertaken several studies related to Ornithology, Conservation Ecology, Conservation Biology, Landscape Ecology, Ecotoxicology, Environmental Impact Assessment, Avian Physiology and Genetics, Extension, Wetland Ecology, and Nature Education. Our studies cover almost all the biogeographical provinces of the country.

Geographically the southernmost area studied during the period is **Agasthiamalai Hills** (Western Ghats, Kerala). The study on the distribution of select faunal groups has brought out interesting spatial patterns of distribution of selected fauna (birds and reptiles) and deeper understanding of the factors governing the distribution along the altitudinal gradient from 50 m to 1868 m above msl. Our study on the **avifauna in the coastal talukas of Sindhudurg District** (Maharashtra) has generated extensive data relating to the abiotic and biotic variables and abundance of birds, spatial and temporal patterns of avian diversity and density and the major threats to the shorebirds along the coast.

SACON has taken up a study on the **Owl assemblage and occupancy** in Andaman Archipelago that comprises of three large islands and around 325 smaller ones supporting about 270 bird species including five species of owls (four endemics and one common with the Indian mainland). The study indicates that species composition of the owls was not structured by interspecific competition; however, this needs further confirmation. Other rules like guild proportionality, nestedness, favoured states and size structure would also be tested once we complete sufficient number of offshore islands. The study of the **Andaman Serpent-eagle**, an endemic (to the Andaman Islands) raptor and a near-threatened species as per the IUCN Red List has recently started. Data regarding its population, distribution and ecology is scarce and scattered. The study plans to explore abundance and distribution of the species, identify its preferred habitat and identify the potential threats to the species.

SACON has been working towards conservation of **Edible-nest Swiftlet** in the Andaman and Nicobar Islands for more than one and a half decades with the support of the Department of Environment and Forests, Andaman & Nicobar Islands. We have almost established a population of Edible-nest Swiftlet in a house, as seen from the return of some individuals, to demonstrate an approach that will lead to recoveries in population of the species and benefit the people

of these islands.

Our work on the **Narcondam Hornbill on Narcondam Island**, the longest in terms of field work in the island, shows that other than 13 *Ficus sp.*, the Hornbill feeds on 21 species of fruits available in the Island. However, only four species constitute around 85% of the food. In addition to the fruits, at times the Narcondam Hornbills were seen picking up grasshoppers, mantids, spiders and skinks to feed the female and chicks in the nest.

Macaca fascicularis umbrosa is a unique endemic primate subspecies limited only to the islands of Great Nicobar, Little Nicobar and Katchal. We have been exploring the social organization, behaviour and phylogeography of the species in these Islands. The species being isolated for long could potentially face inbreeding and genetic isolation among its populations. Apart from generating information about the social organisation and behaviour of the species we have found that the Nicobar macaque is a separate and unique group, with its nearest sister group in terms of genetic distance being the Javan group, living more than a thousand kilometers away.

Of our studies on mammals, in the north-eastern part of the country in Arunachal Pradesh, SACON has been exploring ecological **species sorting in relation to habitat structure in the small cat guild** of Eaglenest Wildlife Sanctuary. The project was taken up to examine the role of morphology in spatial distribution patterns and habitat associations in small and medium cats, examine the relationship between body size and diet among them and compare conventional techniques for surveying small carnivores for cost effectiveness and information obtained. The study has generated valuable information relating to our questions on small cats.

SACON has been investigating the **taxonomic and conservation status of the Forest Owlet**, a critically endangered and endemic species distributed in less than ten locations in Central India. This species rediscovered in 1997 after a gap of 113 years had posed certain questions such as on its patchy distribution and probable hybridisation with the Spotted Owlet (*Athene brama*). In that context, the study essentially aims to explore the phylogeography of the Forest Owlet examining genetic connectivity among various populations, and examining its molecular taxonomy and phylogeny contrasting with other owls. The study is based on

molecular analysis of feather samples collected non-invasively. The study is in progress generating very encouraging and insightful results.

Earthen burrows are important refugia for many species. However, the ecology of burrows is a little explored aspect in the country. We have been pursuing **spatio-temporal burrow use patterns by vertebrates** in Keoladeo National Park (Rajasthan) for the last couple of years. The study reported several species of vertebrates (both predators and prey) occurring together in underground burrows. The present study aims to generate data on factors governing the coexistence of both predators and prey in these burrows. The study showed 13 species of vertebrates, 9 mammals, 3 reptiles and one bird species depending on the burrows.

We have been working on the **woody vegetation and nest tree use by birds** in the riverine forests of Athikadavu Valley (Western Ghats) for a couple of years now. Trees are important for several bird species and in India, more than 100 species of tree-cavity nesting birds have been identified. However, very little information is available about their breeding habits. Our study recorded 70 woody species, of which 54 are utilized by cavity nesting birds in the study area. Our study also highlight the need for measures to be taken by the forest department to control the expansion of agricultural activities alongside the river banks. The work on **threatened plant taxa in Tamil Nadu** was taken up as per the requirement of Tamil Nadu Biodiversity Conservation and Greening Project (TBGP). We covered four Divisional Management Units (Sathyamangalam Wildlife Sanctuary, Point Calimere Wildlife Sanctuary, Mukurthi National Park and Gudalur Forest Division) and generated information for the management of these forest divisions.

High Range Mountain Landscape (**Munnar Landscape**) in the Western Ghats Mountains of Peninsular India is an important biodiversity region in the Western Ghats. In this area as part of the UNDP Munnar Landscape Project SACON was entrusted with four studies; i) Ecosystem requirements of hornbills, ii) Site-specific eco-restoration protocol based on existing community requirements, iii) Land use and Management Plans for Production Landscapes, and iv) Plant-Animal Community Studies in Various Landscape Elements (Birds and Butterflies). Preliminary investigations and field works were initiated in connection with these projects.

Way back in 2006 SACON had done a study looking at the ecology and threats to the **Mangalavanam Bird Sanctuary** suggesting some management measures. In this year, the Kerala Forest and Wildlife Department requested us again to carry out a study on the ecological status of the Sanctuary

since there is reported decline in visit of water birds and heronry species in the sanctuary. Our study suggested some ecological management steps looking at the current scenario.

As part of our ecotoxicology works SACON continues with the monitoring and surveillance of **environmental contaminants in birds** in India. During 2014-2015, fifteen species of dead birds were received from various states. White Backed Vulture, Black Kite, Spotted Owllet and Saras Crane were the notable species in this. Various contaminants such as pesticides, heavy metals, and pharmaceuticals such as Diclofenac were found during the analysis.

During the current year SACON has been involved in environmental assessments, namely i) the potential environmental impacts of wind farm development (in Agali, Kottathara and Nallasingam areas of Attapadi, Palakkad district, Kerala), ii) the impacts of Jangi Wind power farm with special reference to birds and bats, iii) Cumulative Impact Assessment study of Hydro Power Projects on River Yamuna, Tons and tributaries in Uttarakhand; Faunal Aspects, iv) Impact of Hara Wind power project of CLP Wind Farms Ltd on Wildlife including Migratory birds and Raptors (Harapanahalli, Davangere, Karnataka), and v) Preparation of management plan for Fudam Bird Sanctuary (Diu).

As part of our genetic and physiology works, SACON has completed a project on **Identification of RNA transcripts** present in chicken sperm and their relation to fertility. The study has generated novel protocols that can be exploited as fertility bio-markers in birds for captive breeding programs.

Another interesting study that was done during the year is the **ecological and ethno-cultural examination of the rice diversity** in southern India with special reference to the Western Ghats. The investigation could extensively document ecological features of traditional rice paddies. We could also locate some of the very rare cultivars that had unique ecological and agricultural features.

Wetlands have been an important theme on which SACON has been working since inception. In recognition of our contribution to the wetland studies, the MoEF & CC has entrusted SACON the **ENVIS centre on Wetlands**. The SACON ENVIS centre has been awarded 'A-grade' for the financial year 2014-15. The Envis centre perhaps has the largest collection of wetland literature and other information in the country. It is widely used by various researchers, our hit rate crossing more than ten thousand per annum.

Under the theme of wetlands, we have been exploring **the morphological diversity and the ecological patterns in**

the near threatened colonial water birds across Indian sub-continent using novel approach. The study has produced encouraging results in standardization of camera and methods for the non-invasive morphological studies of large heronry species.

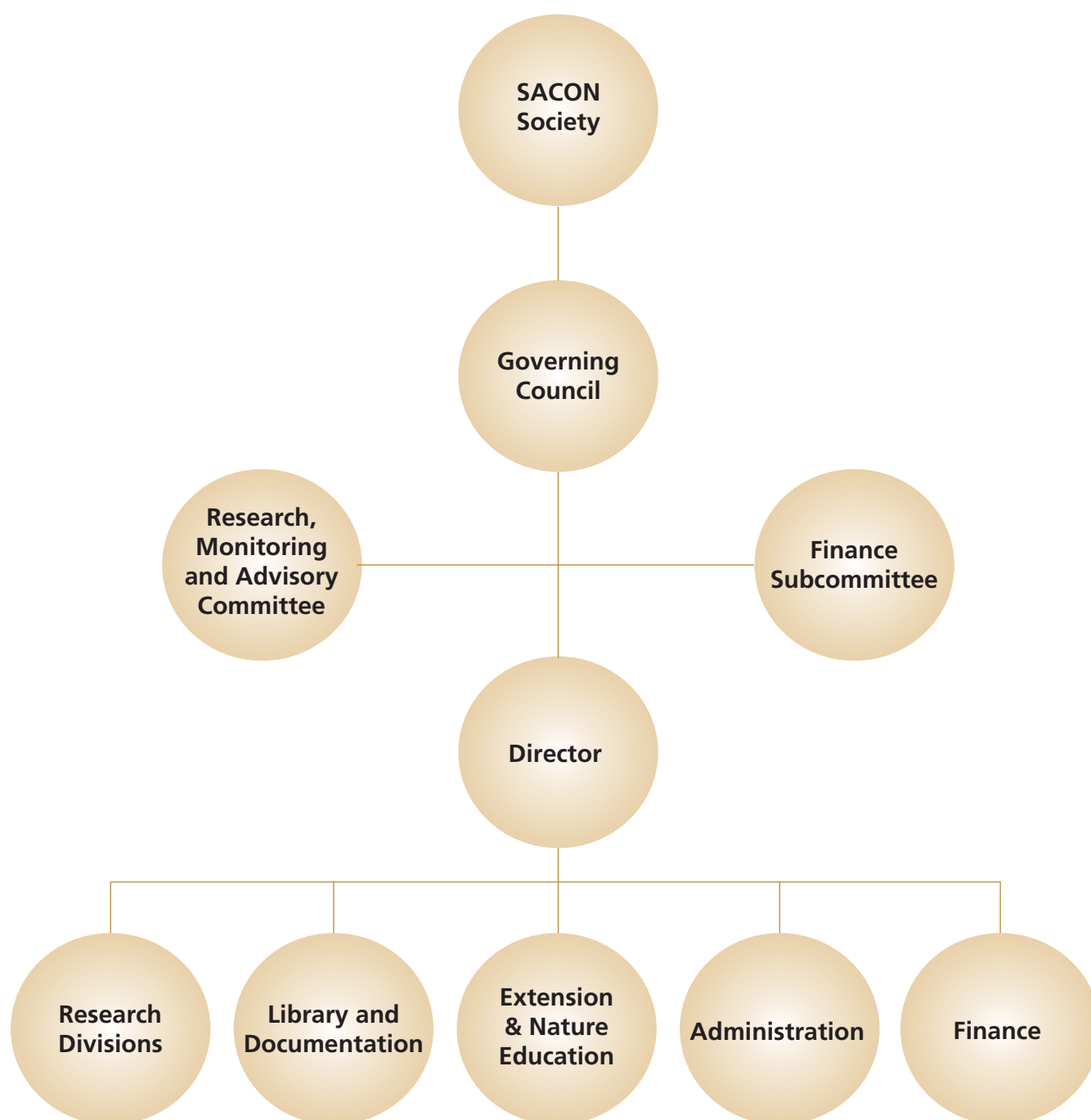
SACON's Nature Education programmes are well received in and around Coimbatore. Twenty seven nature awareness programmes for students were conducted in the campus. Salim Ali Trophy Nature Competitions, an annual inter-school competition was conducted in February 2015. Another important activity during the year was the "Exploring Nature through Birds" a science education programme executed in

collaboration with many partners across the country.

Apart from the research and conservation projects, SACON has been pursuing human resource development programs; as of now, 24 candidates are registered for PhD. Regarding the dissemination of knowledge generated from our research and other activities, during the year, SACON also has published 34 research articles, 24 of which are in professional journals.



ORGANIZATION STRUCTURE OF SACON



SACON Society

SACON Society comprises the President, the members of the Governing Council and experts in the field of ornithology, wildlife sciences and management. The Honourable Minister of Environment and Forest & Climate Change or Minister of State for Environment and Forest & Climate Change is the President of the Society and the Director, SACON is the Member Secretary. The total members in the SACON Society are 29.

The 23rd Annual General Meeting (AGM) of the SACON Society was held on 30th July 2014 at MoEF&CC in New Delhi presided by Shri Prakash Javadekar, Honourable Minister of State for Environment, Forest & Climate Change (Independent Charge), Government of India & President, SACON Society.

Members of the SACON Society

1	Shri Prakash Javadekar Hon'ble Minister of Environment, Forest & Climate Change & President – SACON Society, New Delhi		
2	Dr V Rajagopalan, IAS, Chairman – SACON (GC) & Secretary to the Government of India, Ministry of Environment, Forest & Climate Change, New Delhi (till September 2014) Mr Ashok Lavasa, IAS, Chairman – SACON (GC) & Secretary to the Govt. of India, Ministry of Environment, Forest & Climate Change, New Delhi (from October 2014)	3	Shri. S S Mohanty, IAS, Financial Advisor Ministry of Environment, Forest and Climate Change Paryavaran Bhawan CGO Complex, Lodhi Road New Delhi – 110 003
4	Dr J R Bhatt, Advisor, Govt. of India, Ministry of Environment, Forest & Climate Change, New Delhi (till February 2015) Dr A B Harapanahalli, Advisor, Govt. of India, Ministry of Environment, Forest & Climate Change, New Delhi (from March 2015)	5	Mr Hans Raj Verma, IAS, Principal Secretary to the Govt. of Tamil Nadu Dept. of Environment and Forest Chennai

6	Mr V B Mathur, Director, Wildlife Institute of India, Dehra Dun - 248 001	7	Dr G James Pitchai Vice Chancellor Bharathiar University Maruthamalai Road Coimbatore – 641 046
8	Dr A R Rahmani, Director, Bombay Natural History Society Hornbill House, Sálim Ali Chowk Shaheed Bhagat Singh Road Mumbai - 400 02	9	Dr Renee Borges Chairperson Centre for Ecological Sciences Indian Institute of Science Bangalore – 12
10	Dr. Erach Bharucha, Director, Bharati Vidyapeeth Deemed University Institute of Environment Education and Research, Katraj-Dhanakawadi Pune - 411 043. Maharashtra	11	Prof Bonny Pilo 204 Janardhan Apartments 14 Pratap Gunj Vadodara - 390 002
12	Dr J S Samant Development Research, Awareness and Action Institute (DEVRAAI) 'RAAI' - 379, R K Nagar Kolhapur – 416 013	13	Prof. C K Varshney Emeritus Professor School of Environmental Sciences Jawaharlal Nehru University New Delhi
14	Dr K N Ganeshaiah University of Agricultural Sciences Department of Genetics and Plant Breeding, G K V K, Bangalore - 560 065	15	Prof Anil K Gupta Professor Indian Institute of Management Vastrapur, Ahmedabad Gujarat – 380 015
16	Dr Sukhdev Thakkur, IFS (Retd.) 9, Baskaran Street VOC Nagar Pammal, Chennai – 600 075 (till 21 January 2015) Dr K Thiyagesan, (Retd: Principal, AVC College),Chidambaram (from : 22 January 2015)	17	Dr P Balasubramanian Principal Scientist Division of Landscape Ecology SACON, Coimbatore – 641108 (till 21 January 2015) Dr Rajah Jayapal Principal Scientist SACON, Coimbatore - 641108 (from 22 January 2015)

18	Dr S Muralidharan, Principal Scientist, Division of Ecotoxicology, SACON, Coimbatore – 641108 (till; 21 January 2015)	19	The Principal Secretary to the Government Department of Environment and Forests Office of the Principal Chief Conservator of Forests, Van Sadan, Port Blair Andamans – 744 102 (till 21 January 2015); The Principal Secretary, Department of Environment and Forests, Govt. of Gujarat, Gandhinagar (from 22 January 2015)
20	The Principal Chief Conservator of Forests & Chief Wildlife Warden (WL) Government of Nagaland Dimapur – 797 112 Nagaland (till 21 January 2015) The Principal Chief Conservator of Forests (Wildlife), Maharashtra Forest Department, Government of Maharashtra, Van Bhawan, Civil Lines, Nagpur (from 22 January 2015)	21	The Director Zoological Survey of India M Block, New Alipore Kolkata – 700 053
22	The Director Bannerghatta Biological Park Bannerghatta Bengaluru (till 21 January 2015); Wildlife Warden, Silent Valley National Park, Palakkad, Kerala (from 22 January 2015)	23	The Director Keoladeo National Park Bharatpur – 321 001 Rajasthan (till 21 January 2015) Director, Kaziranga National Park, Bokakhat, Distt. Golaghat, Assam -785612 (from 22 January 2015)
24	Smt. Tara Gandhi A1 Uttaravedi No 7, 2nd Seaward Road Valmiki Nagar Chennai - 600 041	25	Dr L M S Palni GB Pant Institute of Himalayan Environment and Development Kosi-Katarmal, Almora – 263 643 (Uttarakhand)

26	Dr B M Parasharya AINP on Agricultural Ornithology Biological Control Research Laboratory Anand Agricultural University Anand – 388 110, Gujarat	27	Dr P S Easa Director Kerala Forest Research Institute Peechi P.O. Thrissur - 680 005, Kerala
28	Dr Mohan Ram 174, SFS, DDA Flats, Mukherjee Nagar, Delhi – 110 009 (from 22 January 2015)	29	Dr S Balachandran, Scientist, Bombay Natural History Society, Hornbill House, Sálim Ali Chowk, Shaheed Bhagat Singh Road, Mumbai -400 023 (from 22 January 2015)
30	Mr Ritesh Kumar, Conservation Programme Manager, Wetland International South Asia, A-25, Second Floor, Defence Colony, New Delhi – 110024 (from 22 January 2015)	31	Dr R Sukumar, Centre for Ecological Sciences, Indian Institute of Science, Bangalore – 12 (from 22 January 2015)
32	Dr P A Azeez, Director, SACON, Coimbatore - 641 108. (Member Secretary)		

Governing Council

The Chairperson of the Governing Council (GC) of SACON is the Secretary to the Government of India, Ministry of Environment, Forest and Climate Change (MoEF&CC). The GC has 16 members; Financial Advisor to the MoEF&CC, Advisor to the MoEF&CC or nominee, four ex-officio members, eight nominees of the Governing Council and the Director, SACON (Member Secretary). The tenure of the Governing Council is three years. The members of the GC are listed below:

Members of the Governing Council

S.No.	Constitution	Name
1	Secretary to the Government of India, or his nominee not below the rank of Additional Secretary, Ministry of Environment, Forest and Climate Change – Chairperson	Dr V Rajagopalan, IAS, Chairman (till September 2014) Mr Ashok Lavasa (from October 2014)
2	Financial Advisor, MoEF&CC, or his / her nominee from the IFD of the MoEF&CC(Ex-officio)	Shri. S S Mohanty, IAS, Financial Advisor
3	Advisor, MoEF&CC, dealing with the matters of SACON, or his / her nominee (Ex-officio)	Dr J R Bhatt (till February 2015) Dr A B Harapanahalli (from March 2015)
4	Principal Secretary to the Govt. of Tamil Nadu, Dept. of Environment and Forests, Chennai	Mr Hans Raj Verma, IAS
5	Director, Wildlife Institute of India, Dehra Dun (Ex-officio)	Dr V B Mathur
6	Vice Chancellor, Bharathiar University, Coimbatore (Ex-officio)	Dr G James Pitchai
7	Director, Bombay Natural History Society (Ex-officio)	Dr A R Rahmani
8	The Chairperson, Centre for Ecological Sciences, IISc, Bangalore (Ex-officio)	Dr Renee Borges

9-11	Three experts in the field of ornithology	<ol style="list-style-type: none"> 1. Dr Erach Bharucha, Director, Bharati Vidyapeeth Deemed University, Pune 2. Prof Bonny Pilo, Professor of Zoology (Retd), M S University of Baroda 3. Dr J S Samant, Advisor and Trustee, Development Research Awareness and Action Institute, Kolhapur
12-13	Two experts in the field of ecology or in disciplines of natural history	<ol style="list-style-type: none"> 1. Prof C K Varshney, Professor (Retd), School of Environmental Sciences, Jawaharlal Nehru University, Delhi 2. Dr K N Ganeshaiah, University of Agricultural Sciences, Bangalore
14	One faculty from management institutes	Dr Anil Gupta, Professor, Indian Institute of Management, Ahmadabad
15	One representative from public sector enterprises / banks	Vacant
16	Director, SACON (Member Secretary)	Dr P A Azeez

The Governing Council held its 66th meeting on 30th July 2014 at MoEF&CC, New Delhi. The GC is advised by Finance Sub-Committee (FSC), and Research, Monitoring and Advisory Committee (RMAC). The GC has also constituted a Building Sub-Committee (BSC) to oversee and advise on the construction activities at SACON.

Research, Monitoring and Advisory Committee (RMAC)

The mandate of the RMAC is to i) advise the faculty of SACON, ii) review research proposals developed by the Centre, iii) review and assess projects being implemented, and monitor the output; dissertations, reports, papers in scientific journals and other publications, and iv) conduct a review annually of all research and extension activities of the Centre and advise changes, if any. The panel of the Committee is given below.

1. Dr A R Rahmani, Director, Bombay Natural History Society, Mumbai (Chairman)
2. Chief Wildlife Warden, Tamil Nadu or nominee (Ex-Officio member)
3. Chief Wildlife Warden, A & N Islands or nominee (Ex-Officio member)
4. Chief Wildlife Warden, Kerala or nominee (Ex-Officio member)
5. Deputy Inspector General, MoEF&CC, New Delhi (Ex-Officio member)
6. Prof Mewa Singh, Department of Psychology, Mysore University (Member)
7. Dr P S Easa, Director, Kerala Forest Research Institute, Peechi (Member)

8. Prof. B C Choudhary (Retd), Wildlife Institute of India, Dehra dun (Member)
9. Dr E J James, Director, Water Institute, Karunya University, Coimbatore (Member)
10. Mr RSC Jayaraj IFS, Director, State Forest Research Institute, Itanagar (Member)
11. Dr K Thiyagesan, Principal, AVC college, Mayiladuthurai (Member)
12. Dr P Balasubramanian, Principal Scientist, SACON (Member)
13. Dr S Bhupathy, Principal Scientist, SACON (Member, till April 2014)
14. Dr P A Azeez, Director, SACON (Member Secretary)

The Research, Monitoring and Advisory Committee met on 5th August 2014 (27th meeting) at SACON, Coimbatore.

Staff of SACON

The core scientific staff strength of the year (until March 2015) was fifteen; Director (1), Principal Scientist (8), Senior Scientist (2) and Scientist (5) during the period reported.

Scientific

Director	Dr P A Azeez
Ornithology	Dr Rajah Jayapal, Principal Scientist Dr S Babu, Scientist
Avian Physiology and Genetics	Dr R P Singh, Scientist
Conservation Ecology	Dr S Bhupathy, Principal Scientist (upto April 2014) Dr S Manchi Shirish, Scientist
Conservation Biology	Dr S Mukherjee, Principal Scientist Dr H N Kumara, Scientist
Landscape Ecology	Dr P Balasubramanian, Principal Scientist Dr P V Karunakaran, Principal Scientist
Ecotoxicology	Dr S Muralidharan, Principal Scientist
Environmental Impact Assessment	Dr P R Arun, Principal Scientist Dr B Anjan Kumar Prusty, Scientist (upto May 2014)
Wetland Ecology	Dr Goldin Quadros, Sr. Scientist Dr Mahendiran M, Scientist
Extension	Dr Mathew K Sebastian, Principal Scientist
Nature Education	Dr P Pramod, Senior Scientist

Ornithology

1



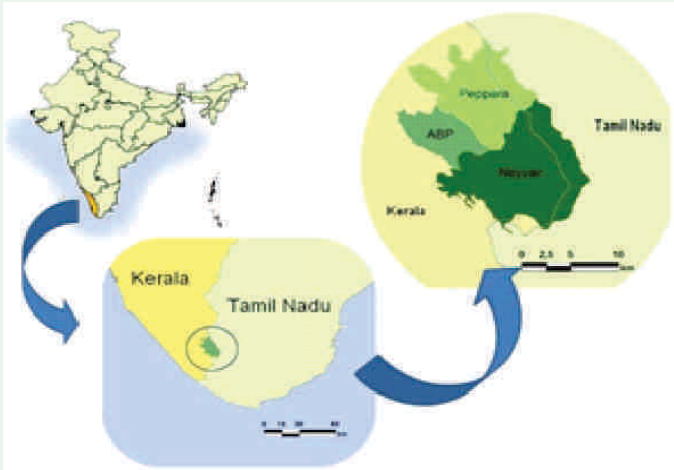
Patterns of distribution of selected faunal groups in the Agasthiamalai Hills, Western Ghats, Kerala, India

This project aims to study the spatial patterns of distribution of selected fauna (birds and reptiles) and factors governing the same along the altitudinal gradient (50 to 1868m above msl) in the Agasthiamalai Hills, Western Ghats. The study intends to explore these spatial patterns of species diversity to develop a protocol to identify, prioritize, and delineate biodiversity-rich sites for further protection in the newly declared Agasthiamalai Biosphere Reserve.

An intensive study area (8°33'N- 77°6'E & 8°43'N 77°15'E) representing most altitudinal categories (50 m to 1868 m) was selected and was stratified at 100 m altitude and gridded (1 sq km) using GIS and Remote Sensing protocols. The sampling effort was largely depending on area availability in each category. In the end, 15 altitudinal categories were delineated and sampling for both reptiles and birds was undertaken in each altitudinal category. Reptiles were sampled using time-constrained visual encounter survey. Birds were sampled using open-width circular plot. Species turnover among different altitudinal categories was estimated using Sorenson's



dissimilarity index. Data on environmental parameters such as canopy, shrub and herb cover, stem density, litter cover, temperature and relative humidity and other microhabitat variables were collected using standard methods. Abiotic factors especially the climatic variables at macro-level (each altitudinal band) have been extracted from Global Climate data (ex. GEOCLIM) besides HOBOS deployed in the field. MAXENT was used to develop species distribution models.



In all, 68 species of reptiles and 194 species of birds belonging to 48 families were observed in 15 elevation categories. When the species richness of reptiles and birds was plotted against the altitudinal categories, it was found that both taxa did not show unimodal pattern as predicted by the mid-domain theory. The decline was slow and gradual till 800 m elevation, but took a steep fall between 800-1200 m. The slight spike in reptile diversity at around 1000-1100m altitude is suspected to be a sampling artefact which is expected to be corrected with further sampling. Further up (above 1200m), the species

richness became extremely low for both the taxa. The highest reptile species turnover among consecutive altitudinal zones was between 1400-1500m and 1500-1865m while for birds it was observed between 200-300m and 1400-1500m. Species distribution models were developed for both *Otocryptis beddomii* and *Xylophis captaini*; It is predicted that potential sites for *O. beddomii* were found south of Periyar Tiger Reserve and best sites ($p > 0.8$) were predicted further south of the Senkottah gap. For *X. captaini*, precipitation seasonality had the highest predictive power among all eco-climatic variables.

Rajah Jayapal, rajah.jp@gmail.com



Owl assemblage and occupancy in Andaman Archipelago, India

Andaman archipelagos, comprised of three large islands and around 325 oceanic islands with various degree of isolation, size and habitat diversity, supports ~270 bird species including five species of owls that consists of four endemics and one common with mainland India. The configuration of archipelagos and diverse species of owls is facilitating a natural laboratory to raise questions pertaining to assemblage and occupancy of owls. In this context, the present study was undertaken to address the assemblage pattern of owls in offshore islands and occupancy in North Andaman.

We surveyed 35 offshore islands of North and Middle Andamans. All five species recorded from Andaman were found to inhabit the islands surveyed. Of the five species, two each belonging to genus *Ninox* and *Otus*, and one belongs to genus *Tyto*. Out of five species, four are insectivorous and canopy dwellers in nature. Oriental Scops owl was recorded more commonly in

all surveyed islands than endemic Andaman Scops owl. However, other three species are found in more or less equal proportion in the offshore islands of Andaman. Presence-absence matrix of all species of owls collected were analyzed for testing the Diamond's Assembly rules, interspecific interaction, using two statistical indices viz., number of species combinations (for first and second Diamond's Assembly rules, which hypothesizes that number of species combinations predicted to be less than expected by chance) and C-score (for fifth Diamond's Assembly rule; which presumes that C-score value should be greater than expected by chance to support the rule). Number of species combinations (Observed index=8.00; Expected index=7.046) and C-score (Observed index=0.80; Expected index=0.89) were not found to be significantly different from the null values produced using Sequential Swap Algorithm and Random Knight's Tour Algorithm

($p > 0.05$). From the above results, it is found that species composition of the study community was not structured by the interspecific competition. But the other rules like guild proportionality, nestedness, favored states and size structure will be tested with the same data set once we complete sufficient number of offshore islands. The project has covered only half of the islands and hence, the results should be treated as preliminary in nature.

We tested the effectiveness of various protocols used for owl sampling and it was found that encounter rate was higher during the call playback method for all species except Andaman Scops Owl. Compared to

spotlight searches, Initial Quiet Listening method appears to be effective sampling method in Andaman. Data collected from 70 spatial grids were compiled to quantify the naïve occupancy and detection probability of owls in North Andaman. The detection probability of owls was ranged from 0.06 for Barn Owl to 0.71 for Hume's Hawk Owl. Except Barn Owl, remaining four species have high naïve occupancy, which is above 0.80. This shows that all lesser owls are found in high abundance in North Andaman.

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Assessing the status and distribution of avifauna within the coastal talukas of Sindhudurg District, Maharashtra

Considering the importance of Indian coastal zone for the conservation of long-distant migratory birds, it is a prerequisite to elucidate the status of wintering bird population and their habitat association. Continuous monitoring of these wintering shorebirds is not happening although the site and species is of great conservation importance. The objectives of the study are to (1) explore the relationship between abiotic and biotic variables and abundance of birds; (2) identify spatial and temporal patterns of avian diversity and density; (3) assess the breeding biology of birds at Burnt Island and White-bellied Sea-eagle and (4) prepare monitoring protocols for birds.

Two hundred species of birds were recorded including 77 wetland species. Out of seven creeks selected for sampling, 40 species each were



White bellied sea-eagle

recorded at Mochamad and Mithbav. Among them, 24 species are shorebirds. Lesser and Greater sand plovers are common and abundant in all the creeks except at Vengurla Bandar. Based on our preliminary analysis, few shorebirds (Broad billed sandpiper, Curlew sandpiper, Terek Sandpiper, Dunlin) are using this coastal stretch as stop-over site and not as a regular wintering ground. It was clearly noticed in Broad billed Sandpiper. It was recorded for the first time in sandy beach of Achara in October and later it was recorded from two localities one in Karli beach and another in Sheroda saltpans in February-March. It shows that these birds are not staying throughout its wintering season in this region but using these sites during inward and return migration. Similar pattern was observed in Curlew sandpiper, Terek Sandpiper and Dunlin. However, further observations



Mixed flock of gulls

during subsequent years may probably shed light on this pattern. Approximately 30 thousand mixed groups of gulls (Black-headed, Brown-headed, Pallas's, Heuglin's, Steppe and Slender-billed gulls) were recorded at Mithbhav and Mochemad. Seven species of gulls were recorded; Brown headed gull and Pallas's gulls were abundant. Large flocks of Gull billed tern, Caspian tern, Lesser and Greater crested terns were recorded at Mochemad. Twenty five individuals of White-bellied sea-eagles were recorded during field surveys from eight localities viz., Devgad, Mithbav, Achara, Karli, Devbag, Nivti, Vengurla Bandar and Mochemad. We found 30 nests from the study



Conservation Ecology

2



Conservation of the endangered species and habitats - the Edible-nest Swiftlet in the Andaman and Nicobar Islands

After the successful Phase-I (1999-2002), II (2002-2008) and III (2009-2015) of a program to conserve the Edible-nest Swiftlet in the Andaman & Nicobar Islands with the support of the Department of Environment and Forests, we are in the process of establishing a population of Edible-nest Swiftlet in a house to demonstrate an approach that will lead wider recoveries in population of the species and benefit socioeconomic status of people of these fragile islands.



House in urban area at Tugapur, Middle Andaman modified as an artificial cave/swiftlet house for ex-situ conservation of the Edible-nest Swiftlet

With almost no grants from the funding agency during year 2014-15 the Andaman Forest Department and SACON decided to continue the Edible-nest Swiftlet conservation program with the objectives of in-situ and ex-situ conservation and setting up a Swiftlet Conservation Co-operative Program. During 2014 the nest count in 205 protected caves reached to 2086. With almost 74% of breeding success, around 2715 chicks fledged successfully by the end of the season. After closing, the protection camps during June 2014, they were reopened during January 2015. The preliminary counts indicated that the population has grown in the protected caves in all the three sites. Ex-situ conservation efforts during year 2014-15 showed positive results with presence of an edible nest constructed in the swiftlet house at Tugapur. Though, more than seven birds were always seem to be roosting in the house, the nest could be seen only during March 2015. We also successfully found additional urban populations in South Andaman island. As an achievement the team was successful in

developing a methodology to estimate the surface texture (roughness) of the cave walls.

Looking at the efforts and achievements and also the uniqueness of the program which deals with the livelihood support and local economic growth of the island people through conservation, it is strongly

Status, ecology and conservation of Narcondam Hornbill (*Aeceros narcondami*) in Narcondam Island, India

Narcondam Hornbill *Aeceros narcondami* is the most endangered hornbill species in the world. This endemic bird is restricted to 6.82 km² Narcondam Island, a dormant volcano, in Bay of Bengal. During earlier studies it was reported that the species is under severe threats from habitat destruction and poaching. With these findings immediate action was taken by the local forest department towards betterment of the species. The project aims to estimate the population of this endangered Hornbill and also understand the potential threats to the species and its habitat on the island.

To understand the feeding ecology of the species, the



Narcondam Hornbill provisioning food at its nest

midden collection and analyses were done. The midden analyses of 10 nests helped us to understand that other than 13 *Ficus* sp., the Narcondam Hornbill feeds on 21 species of fruits available on the Narcondam Island. Around 84.82% of the food item was constituted by only four species (Figure 1). Composition of the food items provisioned at different nests by male Narcondam Hornbill during 2013 is

comparatively less diverse than the observations documented earlier by different researchers. Apart from the fruits, opportunistically the Narcondam Hornbills were seen feeding on grasshoppers, mantids, spiders, skinks to the female and chicks inside the nest. Composition of food provisioned to the nests in four different altitude classes (100msl-400msl) differed significantly.

Change in the composition of the principal diet indicates like variation in the plant phenology, availability of fruits of restricted species during the breeding season, change in the habitat on the island, and also may be effects of the climate change on the vegetation composition and plant phenology, etc. The continuous long term study of the species and its habitat may help us to understand the reasons.

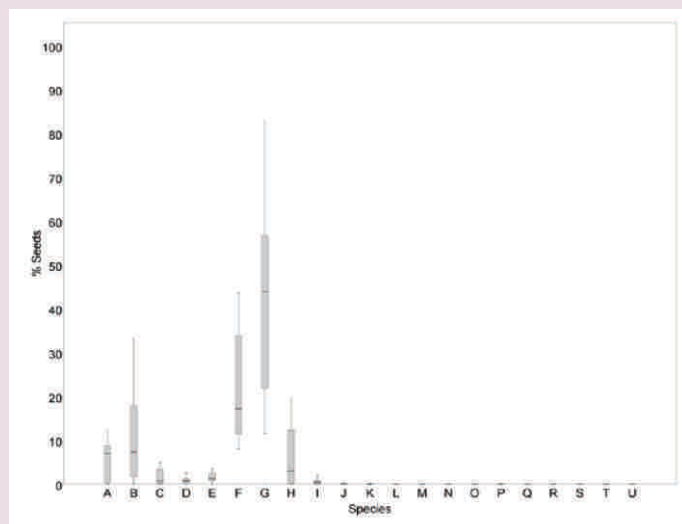


Figure 1. Average proportions of different species of fruits (other than figs) provisioned at the Narcondam Hornbill nests.

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Conservation of the Andaman Serpent-eagle (*Spilornis elgini*) in the Andaman Islands:

Andaman Serpent-eagle *Spilornis elgini* is an endemic raptor categorized in IUCN RedList as Near Threatened species. Data regarding its population, distribution and ecology is scarce and scattered. The publications regarding the species describes its occurrences on different islands and the species is always described as common. As every other raptor, it lacks focused studies. Forests of Andaman Islands are the only known primary habitat of this species. As the forests in these islands are under tremendous threat of logging it is important to know about the effects on the population of these birds. Also hunting incidents of these species from the islands have been reported. We do not know how these disturbances are affecting the species. In the preliminary phase, we try to understand population, distribution, abundance and habitat of the Andaman Serpent-eagle and the threats to the species in the Andaman Islands. The study focused on;

- ★ Estimate population, abundance and distribution of the Andaman-serpent Eagle on the large islands in Andaman.
 - o What population of the Andaman Serpent-eagle exists in the Andaman Islands?
 - o How the Andaman-serpent Eagle is distributed with respect to the forest types in Andaman Islands ?
- ★ Identify potential threats to the Andaman Serpent-eagle in Andaman islands.
 - o What are the potential threats to the population of the Andaman Serpent-eagle apart from deforestation?
- ★ Recommend immediate conservation measures for betterment of the Andaman Serpent-eagle and also identify the key sites for implementation of next phase.

As per work plan proposed, the research scholar in the project was appointed. Initiated survey during February 2015. Received the permissions from Andaman Forest Department to carry out the data collection in the protected areas. As the data collection is just initiated no results can be presented at this stage.



Andaman-Serpent Eagle (*Spilornis elgini*)

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Conservation Biology

3



Ecological species sorting in relation to habitat structure in the small cat guild of Eaglenest Wildlife Sanctuary, Arunachal Pradesh.

Nine of the 15 species of felids found in India, occur in the North-East, perhaps the richest anywhere in the world. Cat morphology frequently indicates evolutionary origins with long tails suggesting arboreality and short tails, adaptation to open habitats. We propose to explore if felid morphology is strictly related to habitat structure, facilitating co-existence particularly in a high diversity region. This project aims to study this in Eaglenest Sanctuary in the West Kameng district of Arunachal Pradesh, through non-invasive sampling using scats, molecular tools, camera trapping and spatial analysis on the GIS platform. The project was taken up with the following objectives : (i) examine the role of morphology in spatial distribution patterns and habitat associations in small and medium cats in EWS, (ii) examine the relationship between body size and diet for felids in EWS and (iii) compare conventional techniques for surveying small carnivores for cost effectiveness and information obtained.

A vegetation map is being prepared by using the Geographical Information System (GIS) platform and data derived from information sources such as Survey of India toposheets, satellite images, GPS points and field inventory. GPS receivers will be used to identify the coordinates of ground truth points during field surveys. Forest vegetation map of the Sanctuary will be prepared through supervised classification of satellite images. Apart from this, data on climatic variables (temperature, rainfall and light levels) will also be collected across altitudes using weather stations with relevant sensors.

Scats are collected along the motorable road running through EWS and along trails inside the forest. GPS coordinates; date and relevant information for each scat location are noted. Scats are transferred in alcohol to laboratory for further analysis using molecular tools for assignment to species as well as to determine diet.

Heat sensory camera traps have been deployed for opportunistic as well as systematic sampling in order to maximise results to inventory species as well as quantify results of habitat use. We are comparing several sampling designs for camera trapping in mountainous terrain with dense forests. The first design is of 30 cameras 500m apart in a cluster for 20 days, the second of 30 cameras in 15 randomly picked grids (2 cameras per 1 sq km grid) across the sanctuary and the third of 30 cameras in 30 randomly picked grids (1 camera per grid) across the sanctuary. Sampling will be done close to the road as well as deep inside the forest and results from these will be compared.

A replicate sampling with camera traps for the month of summer in one of the areas was conducted. 28 camera traps were deployed for a period of 20 days in May 2015.

A digitized boundary for EWS was procured along with a map of the road running through the Sanctuary, from earlier studies conducted there. Based on this, the area was gridded in 1 sq km units for sampling. To date we used a 2 km buffer on either side of the road to conduct our sampling.

LISS IV imageries for the area have been procured and the GIS analysis for vegetation structure is underway. Structural aspects of the habitat (percent of canopy cover) are collected around each camera trap as well as on trails inside the forest. This will be used as ground truthing points.

Permits from the Arunachal Pradesh Forest Department to begin work were obtained in August 2014. A Program Fellow was appointed in the project in September 2014 and field work was initiated from

November 2014.

A total of 365 scats were collected from November 2014 to March 2015. Scat analysis was initiated in March 2015 and we have extracted DNA from 64 scats to date. 60% of these have tested positive for felids. Sequence results are awaited.

30 heat sensor camera-traps have been procured along with 3 weather stations and 3 GPS units. To date a total of 3150 camera trap nights in winter have been covered in 2 sampling designs. The cluster design has been used in 3 areas (Lama to Eaglenest Pass, Pass to Chacko, Chacko to Bompu) while the second design used 15 randomly picked grid with 2 cameras in each grid for 45 days. In addition 560 camera traps nights in summer (as a comparison for one site only) have been covered in May 2015.

Camera trap data shows the presence of leopard cat, golden cat, marbled cat and clouded leopard apart from several other species such as red panda, Himalayan black bear, Himalayan marten, Himalayan palm civet, serow, goral, barking deer, sambar, wildboar, porcupine, Arunachal macaque, Temminck's tragopan, hill partridge, khaleej and some unidentified rodents. Camera trapping is ongoing and we are collating records with respect to habitat, aspect and altitude and will begin analysis once we complete the sampling.

Camera trapping results show the presence of several morphs of golden cat, the patterned/'Ocelot' morph has not been recorded from India before. It is interesting to note that all these morphs occur within a very small area of EWS.

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Determining the taxonomic and conservation status of the Forest Owlet (*Heteroglaux blewitti*)

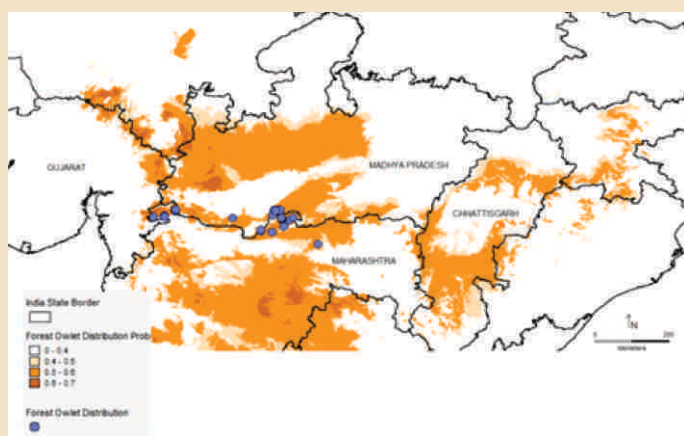
The Forest Owlet (*Heteroglaux blewitti*) is a critically endangered, endemic species distributed in less than ten locations in Central India. This species was rediscovered in 1997 after a gap of 113 years when it was believed to be extinct. Its distribution is extremely patchy with no information on connection between various populations. Its primary habitat is under

severe threat from anthropogenic pressure which has probably led to the extinction of some earlier pockets of populations. On another issue, a recent article speculated on the possible hybridization of the Forest Owlet with the Spotted Owlet (*Athene brama*) which met with severe criticism. However, there is no scientific evidence for or against this claim. The current proposal aims to study the phylogeography of

the Forest Owlet to examine genetic connectivity between various populations, examine its molecular taxonomy and phylogeny with other owls and resolve the issue of possible hybridization with Spotted Owlet. The study is based on molecular analysis of feather samples collected non-invasively.

To enable us to address our objectives, we collected a total of 27 Forest Owlet feather samples from Auliya Reserve Forest (Khandwa) and surrounding area. We also collected six Spotted Owlet moulted feather samples from nest-sites. Taxonomic and point location data was obtained from published literature. Spatial distribution data of species of interest was downloaded from <www.iucn-redlist.org> portal. Genetic sequences of out-group species were downloaded from <http://www.ncbi.nlm.nih.gov/>. DNA was extracted from samples, collected non-invasively, using QIAGEN tissue kits. Published PCR primers were used for amplifying two mitochondrial genes (Cytochrome b-oxidase and Cytochrome oxidase I) and two nuclear genes (Recombination activating gene – 1 (RAG-1) and Tissue growth factor beta 2). Cleaned products were sent for sequencing.

Point location data was used for building exploratory Climatic Niche Models (CNM) using MaxEnt v3.3.3k. Six climatic variables for moisture and temperature were used for the model. Preliminary phylogenetic



trees were built using maximum likelihood (RaxML) and bayesian (Mr. Bayes) algorithms.

Figure 1. Climatic niche model of distribution of the Forest Owlet.

The exploratory model showed that apart from known locations of the species, there is potentially suitable habitat scattered across its known range (Figure 1).

The current taxonomy of Forest Owlet places it in a monotypic genus, *Heteroglaux*. Our phylogenetic analysis shows that Forest Owlet and Spotted Owlet are not sister species. However, our results also show that the Forest Owlet falls within the *Athene* genus

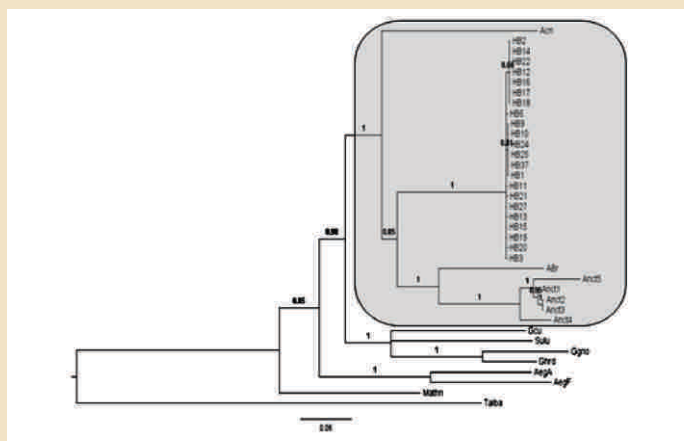


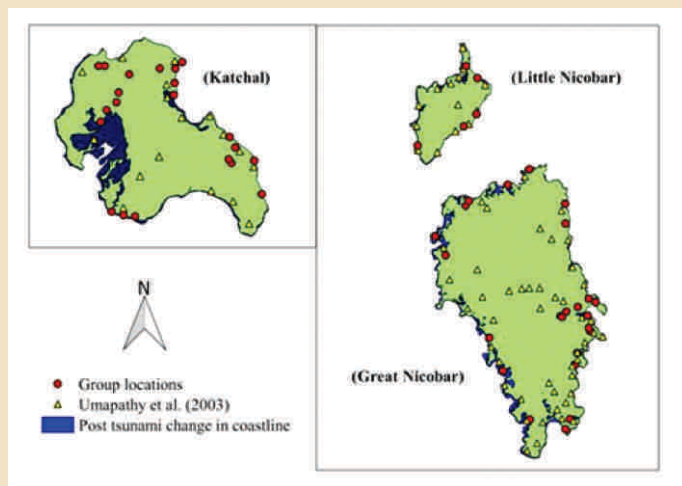
Figure 2. Bayesian phylogenetic tree based on concatenated Cyt B and Co I sequences (1565 bp). The trees were built using Mr Bayes plugin in Geneious v6.0. Talpa = Barn Owl *Tyto alba*; Mathn = Elf Owl *Micrathene whitneyi*; AegA = Northern saw-whet Owl *Aegolius acadicus*; AegH = *Aegolius hardyi*; AegF = Tengmalm's Owl *Aegolius funerus*; Sulu = Northern Hawk-Owl *Surnia ulula*; Ghrd = Amazonian Pygmy-Owl *Glaucidium hardyi*; Gnan = Austral Pygmy-Owl *Glaucidium nanum*; Ggno = Austral Pygmy-Owl *Glaucidium gnoma*; Gcu = Asian Barred Owlet *Glaucidium cuculoides*; Grad = Jungle Owlet *Glaucidium radiatum*; Gpas = Eurasian Pygmy Owl *Glaucidium passerinum*; Acn = Burrowing Owl *Athene cunicularia*; HB = Forest Owlet *Heteroglaux blewitti*; Anct = Little Owl *Athene noctua*; Abr = Spotted Owlet *Athene brama*. The nodal value indicates posterior probability values. High value indicates high support for the node. Grey region = position of the genus *Athene*. The nodal value indicates posterior probability values. High value indicates high support for the node. Grey region = position of the genus *Athene*. The scale shows nucleotide substitutions per site.

Preliminary analysis on phylogeny shows that the Forest Owlet is probably a genus *Athene* member. Based on a niche model that we built (Figure 1) using historical records and current surveys, we expect to find the Forest Owlet in certain pockets of Madhya Pradesh and Maharashtra outside its known range.

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Social organization, behaviour and phylogeography of *Macaca fascicularis umbrosa* on the Nicobar Islands, India

In India, data on the unique endemic subspecies, *Macaca fascicularis umbrosa*, is limited only to a status report from a short survey. This subspecies is endemic to three islands viz. Great Nicobar, Little Nicobar, Katchal. The inhabited islands have been isolated since long and this could potentially result in inbreeding within, and genetic isolation among populations. The consequence of this would be high genetic distance among, populations resulting in strong genetic structure. Phylogeography utilizes



standing patterns of genetic variation to explain historical events such as migrations and demography over space and time. We initiated to document and study the phylogeography, social organisation and behaviour of *Macaca fascicularis umbrosa* in the Nicobar Islands. All the three Islands were surveyed using existing trails. Location, group size and age-sex of the individuals were recorded. Faecal samples were collected for molecular work in vials containing alcohol and transported to a lab for extraction of DNA and further analysis. Scan sampling has been followed for data collection on activity budgets. The focal group has been followed from 0700 to 1800 hr. Individual identification of all the group members was made, and focal animal sampling has been followed to understand the behaviour pattern and individual interactions.

We walked 212.14 km and sighted 79 groups of long-tailed macaque. Percent adult females were lesser in the Katchal than in the Great Nicobar, where the immature were more in the Katchal than in the Great

Nicobar. West coast of these islands was inundated up to 2.80 km in some of the islands that includes large tract of swamp forests due to 2004 Tsunami. Habitat loss and decline in the population size are the immediate impact of tsunami on macaques in Nicobar Islands. However, the relative abundance significantly increased from 2006 to 2014, which indicates, speedy recovery in their population size following sharp decline in their population following Tsunami.

The DNA was isolated from 64 faecal samples of which, 37 samples gave positive PCR amplification. Thirty samples were sequenced from the D-loop region. Out of these, seven samples were from Great Nicobar and 23 samples from Katchal. The six samples from Great Nicobar and Katchal were sequenced for the 12s and 16s ribosomal gene. We downloaded sequences of two sub-species from



NCBI to examine the phylogenetic relationships. The *Macaca fascicularis fascicularis* subspecies is distributed throughout the South Asian countries and is genetically structured and has several sister groups. The Indonesian group is paraphyletic and occurs in more than one clade. This may be due to the translocation of the species into islands. The Nicobar macaques are in a separate group (unique) and are sister to the Javan group.

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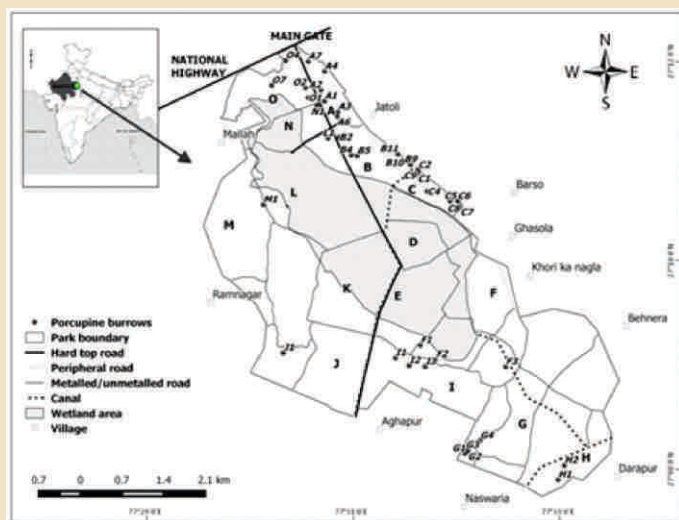
Spatio-temporal burrow use patterns by vertebrates in Keoladeo National Park, Bharatpur, Rajasthan, India

In arid and semi-arid conditions, due to scanty rainfall and high fluctuations in temperature, it appears that earthen burrows act as important refugia for many species. A study conducted in Keoladeo National Park (KNP), Bharatpur reported the occurrence of several species of vertebrates (both predators and prey) together in underground burrows. However, factors determining faunal assemblage and activity of these species are unknown. The present study aims to provide data on factors governing the coexistence of both predators and prey in underground burrows. The study is being undertaken at Keoladeo National Park, which is one of the Ramsar sites. Animals inhabiting Indian Crested Porcupine (ICP) *Hystrix indica* burrows are being studied, as this is the most prevalent system at KNP. All the burrow locations were marked using GPS. Number of burrow openings, active and inactive, orientation, distance from water source and disturbance level were recorded. Habitat analysis has

recorded using automatic data loggers. High sensitive passive infrared (PIR) motion sensor cameras were deployed to determine number of porcupines and other animals using a burrow system. Data collection is being done twice in a season for five days each. It is planned to study the burrow used by various animals using burrow Video Camera.

In all, 41 Porcupine burrow systems were recorded in KNP (2 burrows/ sq km). Porcupine burrows were distributed largely in clusters and most of them were present on the periphery of the wetland. 38 plant species were recorded within 10 m radius of Porcupine burrows. The median distance to the nearest perennial woody species was 2.75 m. Preliminary analysis showed no significant correlation between presence/absence of burrows per grid and vegetation stand structure. Twenty burrows were randomly selected to study number of animals dwelling there. A total of 850 trap days across all openings (34 openings X 5 days X 5 replications in different seasons) showed 13 species of vertebrates; including 9 mammals (porcupine, rat, mongoose, jackal, bat, jungle cat, squirrel, black-naped hare, hyena) 3 reptiles (gecko, python, monitor lizard) and one bird species (Indian robin). Camera trapping revealed pattern of porcupine activity outside burrows with following mean detections. Standard error is expected to decrease with increase in sampling efforts over next seasons. Similar activity patterns for other burrowing species will also be determined. The camera trapped data so far revealed 13 vertebrate species using these burrows either regularly (e.g. Porcupines, Indian Pythons, Bats) or at some stage in their life cycle (e.g. littering by Golden Jackals and Striped Hyenas).

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KNP_Porcupine burrow

been done using circular plot (10 m radius for trees, 1m for herbs). Plant species, their number, % ground cover and % cover over the burrows were recorded. Nearest woody plant to the burrow was also noted. Area of each opening was measured using offset method for calculating area of irregular shapes. Temperature and Relative Humidity data are being

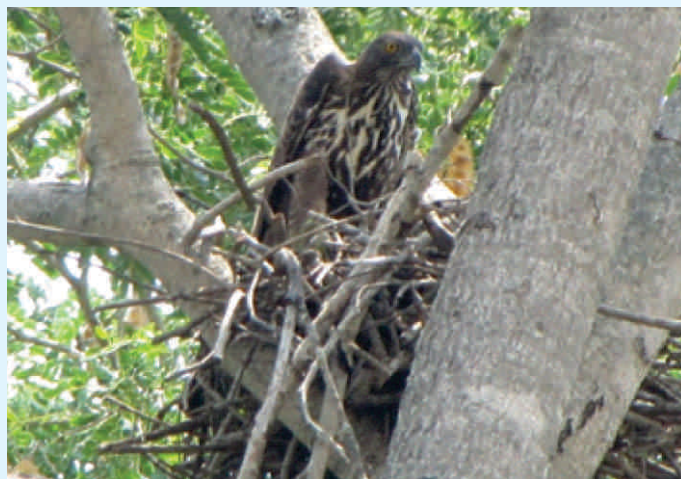
Landscape Ecology

4



Ecological investigation of woody vegetation and nest tree use by birds in the riverine forests of Athikadavu Valley, Western Ghats

Among the various tree strata used by birds for nesting, bole and canopy are very important. While the cavity nesters such as parakeets, owls, barbets, hornbills, woodpeckers, kingfishers and starlings & mynas use the cavities of live and dead trees, stick-nesting birds such as kites, eagles, vultures, a few owls and some water birds use the tree canopy. Cavity nesting birds prefer diseased, dying or dead trees because it is easier to find or excavate cavities in such trees. In India, more than 100 species of tree-cavity nesting birds have been identified, but very little information is available about their breeding habits. In the above background, it was felt that a study on tree diversity and its use by birds in the riverine forests of an important river system-the Bhavani -tributary of Cauvery- would be useful for protecting the riparian biodiversity. The study was carried out in Athikadavu valley (11°12'48.19" N & 76°45'22.94" E) in the Coimbatore Forest Division, Western Ghats.



Changeable Hawk Eagle

The vegetation survey in the riverine forests indicated the occurrence of 70 woody species belonging to 38 families. Moraceae constituted the largest family with eight species. The dominant tree species were *Pongamia pinnata* (IVI-74.64) *Diospyros peregrina* (41.75) and *Mangifera indica* (41.16). Bird community study

revealed the presence of 157 species belonging to 51 families. Out of 51 families, Cuculidae constituted the largest family with 12 species. Four near threatened bird species namely Malabar Pied Hornbill, Great Hornbill, Greater Grey-headed Fishing Eagle and Indian Darter were found here. Thirty two species are cavity nesting birds, which include woodpeckers, hornbills, barbets, parakeets, mynas, owls and tits. Eight raptor species have been recorded.

A total of 287 nest trees belonging to 54 species were utilized for nesting by cavity nesting birds. The 302 nest trees included 263 live trees and 24 dead trees. Maximum number of nests were located on *Terminalia arjuna* (42; 13.91%) followed by *M. indica* (27 ; 8.94%) and *Melia dubia* (21 ; 6.95%). Out of 302 cavity nests, 102 (33.77%) belonged to primary cavity nesters and 200 (66.23%) belonged to secondary cavity nesters. Highest number of cavities were used by Common Myna (55; 18.21%). Highest number of tree species were used by Common Myna (n=22) followed by Brown-headed Barbet (n=20) and White-cheeked



Coppersmith Barbet

Barbet (n=18). Ivlev's Index of selectivity was used to estimate nest tree species preference for cavity nesters. It showed preference to *T.arjuna* (PI=0.95) followed by *M.indica* (PI=0.93) and *M.dubia* (PI=0.91).

.A total of 13 raptor nests were located in the riverine forest and nest tree features were studied. Mean height of the nest tree, mean girth at breast height,

mean nest distance from the first branch of the trunk, nest height for Greater Grey-headed Fish Eagle were 24.37 ± 5.3 , 316.6 ± 50.6 , 3.94 ± 1.5 and 19.5 ± 9.5 respectively.

A total of six tree species were utilized for nesting. Ivlev's Index of selectivity was used to estimate nest tree species preference. Highest preference was observed for *Albizia lebbbeck* (PI=0.50) and *Hardwickia binata* (PI=0.50) followed by *Terminalia bellirica* (PI=0.33).

Bhavani river bank vegetation in Athikadavu and Pillur comprised of unique species composition. Species such as *M. indica*, *Calophyllum apetalum*, *Diospyros peregrina*, *Madhuca longifolia*, *T.arjuna*, *Syzygium cumini* offer suitable substrate for roosting and breeding of birds. The Irula tribes here damage live trees by cutting branches and wood for various needs. Hence, it is suggested to protect the nest trees from anthropogenic impacts. As dead trees of certain species (*M. indica*, *T.arjuna*, *Alseodaphne semecarpifolia*, *Hopoea ponga*, *M.longifolia*, *D.peregrina* and *Strychnos nux-vomica*) are favoured by cavity nesting birds, it is suggested to advise the tribals not to remove the dead trees. Agricultural activities are expanded to riverine fringing habitats, leading to destruction of the riparian forest. This affects the birds and other wild fauna of the riparian habitat. Hence, measures need to be taken by the forest department to control the expansion of agricultural activities alongside the river banks.

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Status and distribution surveys of threatened plant taxa in Tamil Nadu

Tamil Nadu Forest Department has formulated Tamil Nadu Biodiversity Conservation and Greening Project (TBGP) primarily aimed at assessment of wild plant taxa for conservation of vital biodiversity of the state both inside the Protected Areas and Reserve Forests. The initial step is outlined for the assessment of wild threatened taxa in the forest areas based on IUCN criteria. A state wide assessment plan was planned and it was decided to carry out the survey in 17 Divisional Management Units (DMU) across Tamil Nadu. Of the 17 DMUs, four namely, Sathyamangalam Wildlife Sanctuary, Point Calimere Wildlife Sanctuary, Mukurthi National Park and Gudalur Forest Division were assigned to SACON. The specific objectives of the project are to prepare the checklist of plant species in the above four DMUs, list out the endemic and threatened taxa in the DMUs, and assess the status of the threatened plant taxa (IUCN) in the DMU.

Vegetation assessment was done by using nested-quadrat method. Trees, shrubs, bamboos and lianas found in the 0.1 ha plots were recorded. Trees measuring >10 cm diameter DBH (diameter at breast height) were measured and recorded. Shrubs and saplings were measured in the two 5 x 5 m quadrat laid within the 0.1 ha plot. Four 1 x 1 m plots were laid within the 0.1 ha plot to record herbs and seedlings. Number of quadrats to be laid in each DMU was allotted by the Tamil Nadu Forest Department. It included 56 quadrats for Sathyamangalam Tiger

Reserve, eight quadrats for Mukurthi National Park, eight quadrats for Point Calimere Wildlife Sanctuary and eight for Gudalur Forest Division.

Sathyamangalam Tiger Reserve: In total, 660 plant species belonging to 131 families were recorded during the vegetation sampling of 76 quadrats. Poaceae (71) was found to be the most dominant family. Highest number of species (288) was recorded in the Southern Dry mixed Deciduous Forest. A total of 90 endemic plants of 41 families were recorded. Twenty three threatened species (IUCN) belonging to 18 families were recorded.

Mukurthi National Park: In total, 409 plant species belonging to 98 families were recorded in the quadrats. It included 37 endemic species belonging to 27 families and 19 IUCN threatened species belonging to 9 families. Most dominant family representing endemic species included Lauraceae.



Vanda spathulata

Gudalur Forest Division: In total, 686 plant species belonging to 100 families were recorded in the quadrats. This included 95 endemic species belonging to 38 families and 21 IUCN threatened species belonging to 16 families. Lauraceae formed the most dominant family representing both endemic and threatened species.

Point Calimere Wildlife Sanctuary: A total of 124 species were found in the quadrats. Three endemic species and two IUCN threatened plants were recorded.



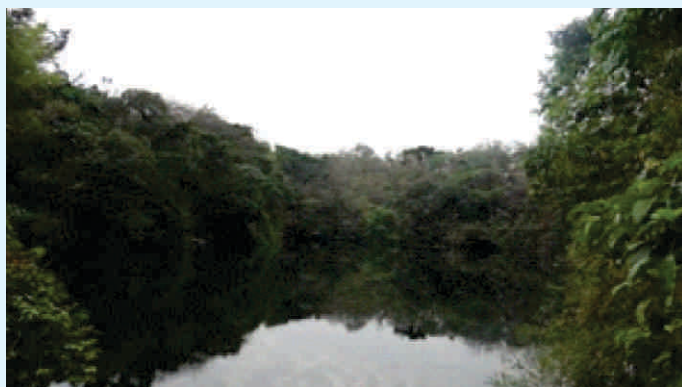
Rhododendron arboreum

Among the four DMUs, Sathyamangalam Wildlife Sanctuary and Gudalur Forest Division are rich in plant diversity and also harbouring large number of endemic (*Michelia nilagirica*, *Rhododendron arboreum*, *Syzygium densiflorum*, *Bridelia crenulata*, *Barleria longiflora* etc.) and threatened plants. Species such as

A study on ecosystem requirements of hornbills in Munnar Landscape Project Area

High Range Mountain Landscape (Munnar Landscape) in the Western Ghats Mountains of Peninsular India is a globally significant biodiversity region. The project area, Munnar Landscape is a very complex landscape represented by a variety of landscape elements with competing and complementing roles in human kind. There have been large tracts of medium elevation tropical evergreen forests which have been hitherto modified into production area such as cardamom estates. The large scale conversion and change in cultivation practices of cardamom in the recent decade made considerable changes in the habitat that impaired the survival of many species including hornbills. Hornbills are also termed “keystone species” for their overbearing role in their ecosystems and are one of the 'flagship' species of their region (Kemp 1995, 1993). Hornbill is an indicator species of undisturbed forest patches and top priority in terms of conservation on account of their narrow geographical range, specialized habitat preferences and low levels of local populations. Fruit resource availability is predominantly responsible for fluctuations in

population density levels of hornbills and other frugivorous avifauna. Due to their wide ranging nature, hornbills move viable seeds to far away locations in the forest landscapes and aid in forest regeneration like an ecosystem engineer. Any conservation strategy prepared for a wide ranging species like hornbill in other words address the larger issue of landscape level management for sustainability, biological diversity and ecosystem integrity. Hence to chart out the ecosystem requirements of hornbills and suggest conservation measures this project was undertaken.



Hornbill habitat in Thattekad



Great Hornbill

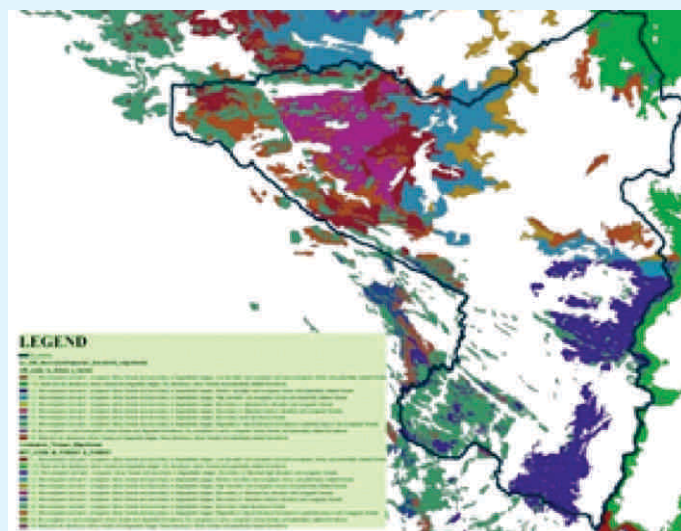
One time field survey was carried out in six major areas, namely Idukki Wildlife Sanctuary, Thattekad bird Sanctuary, Cardamom Hill Reserve, Idamalayar Range, Chinnar Wildlife Sanctuary and Anaimudi Shola National Park. Only one species (Malabar Grey Hornbill) was sighted. This species was recorded in Thattekad bird sanctuary (n=4) and Idamalayar Range (n=1). Literature sources indicate the occurrence of all the four species of hornbills in the project area. A hornbill distribution map was prepared with the available data.

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Developing site-specific eco-restoration protocol based on existing community requirements in Munnar Landscape Project Area

A major conservation issue, particularly in the tropics is habitat loss and fragmentation due to developmental activities and increasing human populations. Munnar landscape has an intricate development history such as Grow More Food Programme, High Range Colonization Scheme, Co-operative Settlement Scheme, Settlement of Agricultural Labourer river valley projects, extensive commercial and forestry plantations, and extensive collection of forest resources has lead into the degradation and fragmentation of pristine habitats. Hence eco-restoration has been identified as one of the major projects under the India High Range Landscape Project (Munnar Landscape Project). The major objectives of the projects are (i) identify, document and prioritize sites/habitats in the landscape for eco-restoration activities, (ii) conduct review and document the eco-restoration practices presently adopted by KFD, (iii) review the existing acts

richness of biological diversity, landscape analysis, edaphic and topographic features, extent and number of high biodiversity value areas and their degraded forms and mapping them suitably. The people's dependency and their requirement of forest



and policies related in the light of conflicting interest between development and local community, (iv) develop monitoring protocol with baseline information, and (v) develop a protocol containing innovative and cost-effective eco-restoration practices for each identified site/habitat in the landscape based on the existing community requirement in the light of existing acts and policies

The objectives will be achieved through prioritizing patches or areas for eco-restoration based on careful examination of forestry and developmental activities,

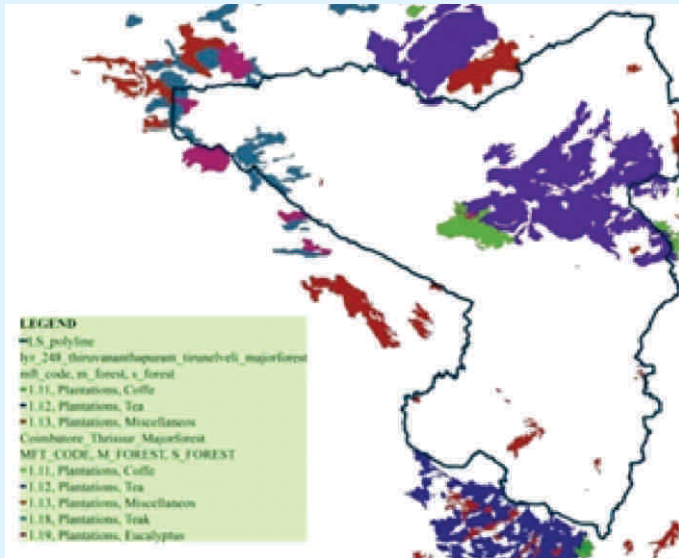
resources will be assessed for facilitating the species for restoration. The best practices if any implemented by the relevant stakeholders in the region will be assessed and utilised for the purpose. Baseline information and monitoring protocols will also be developed and an integrated strategies and action plan for restoration will be prepared.

Since the project is initiated in January no specific results are obtained. However the progress includes collection of relevant secondary information (Spatial/non special data) on forest degradation from the forest administrative documents, published scientific papers and books. We also documented the success models from the different parts of Western Ghats and other tropical countries. The shifting cultivation, construction of dams, raising monoculture plantations (exotic and resident) and forest fire are the major problems for the degradation of the landscape. The available spatial data on forest degradation was gathered from the vegetation map prepared by French institute, Pondicherry and that gave an insight to prioritisation of areas for restoration.

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Landuse and management plans for production landscapes in Munnar Landscape Area

The High Range Landscape of Kerala was subjected to extensive commercial and forestry plantations by cutting down the natural forests. Since the area is highly complex in its structure and attributes, the impact of such conversion on conservation was



incredibly huge and large spectrum of both plants and animals are affected due to this. In order to address this issue, it was envisaged to mainstream the production activities with conservation of biodiversity. Hence to facilitate such policy level intervention a project entitled land use and management plans for production landscape was identified under the Munnar Landscape Project. The



project envisages the following objectives, (i) identification and mapping of different commercial and forestry production landuses, (ii) characterizing the production landscapes, (iii) assessing the ecological and conservational importance of production landscapes, (iv) identification of management threats/issues that impede biodiversity conservation and environmental health in the production landscape, (v) conduct review of the management inputs into different production landscapes, (vi) develop a tool kit (spatial data base) on production landscapes of the project area and (vii) develop landuse management plan with specific strategies for mainstreaming biodiversity



conservation for different production landscapes.

The objectives will be achieved through a participatory research process involving other stakeholders in the area since vast stretches of lands are under private ownership. Identification of production landscape will be carried through mapping and characterization will be done with the help of ancillary data. The importance of production landscape for conservation will be carried out through meticulous observation of habitat utilization of animals and presence of conservation important species in the vicinity of the production landscape. The existing management inputs will be reviewed through direct interactions with stakeholders as well as documents pertaining to plantations and the

conservation measures if any taken place will also be noted. Based on the above information a tool kit on production landscape and management plan will be prepared.

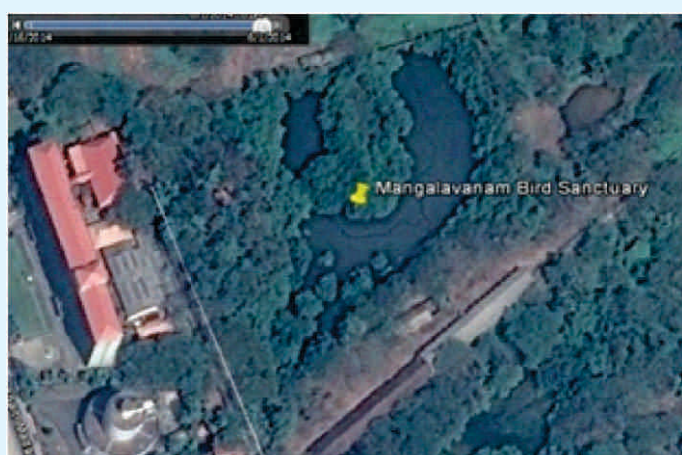
Regarding the progress, the information on the type and extent of different production landscape has been collected through various literature and

administrative reports. The habitat utilization of the natural patches among the tea garden and crop raid and human wildlife conflict in the Anjanad Valley in the east are noted.

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Habitat assessment of Mangalavanam Bird Sanctuary

The Kerala Forest and Wildlife Department requested Sálím Ali Centre for Ornithology and Natural History (SACON) to carry out a study regarding the ecological status of the Mangalavanam Bird Sanctuary since it was reported that there is a decline in the visit of water birds and disappearance of heronry in the sanctuary. We were asked to look into two aspects; (i) examine the factors that adversely impacted in the Mangalavanam Bird Sanctuary and (ii) suggest short term and long term measures to restore the bird population. The study has three components (i) the vegetation and its overall structure, (ii) environment quality denoted as water, and sediment and (iii) the bird population. Vegetation and environmental parameters were studied using primary data collection and analysis, google images and direct observation. For studying birds, secondary information and one time observation data was used.



In total, 95 species of birds belonging to 15 Orders and 42 Families were found in Mangalavanam. Of these, 69 species are residents, 13 are local migrants, and another 13 species are winter visitors. With

regard to habitats, woodland birds (34%) followed by water birds (23%) form the majority of the sanctuary's avifauna. Foraging habits of the birds indicates that insectivores (36%) are the predominant guild closely followed by birds that feed on aquatic invertebrates (21%). Among the three major habitat groups, it was the open-habitat birds that showed remarkable decline in species richness.

Over a period of twelve years (2002-2014) it was found that there is a decrease of about 35% of open water spread area in the sanctuary and in relation to total area of the PA, it has reduced from 33% to 21%.

Regarding the environmental quality, we found that the chemical and physical properties of water and sediment such as pH, Electrical Conductivity (EC) and Total Dissolved Solids (TDS), Salinity, Free Carbondioxide (FCO₂), Dissolved Oxygen (DO), Chemical Oxygen Demand (COD), BOD, Total Alkalinity, Chloride, Total Hardness, Alkali metals, Oil and grease, Total Nitrogen (TN), Nitrate-Nitrogen

(NO³-N), Nitrite-Nitrogen (NO²-N), Sulphate were found highly unsuitable for the maintenance of healthy population of aquatic organisms including planktons. Among the phytoplankton group diatoms are dominant than the dianoflagelets.

Bacillariophyceae (44%) is one among the dominant family followed by Cholrophyceae (40%). The zooplankton reported were in the order copepods (39%) > rotifers (32%) > nauplii (16%) > cladocera (8%) > polychaete (5%). The tidal influx and the waste water which is flowing from the neighbouring commercial establishments are polluting the habitat of Managalavanam Bird Sanctuary.

The major recommendations of the study are (i) desilting the sanctuary area on experimental basis since

it may not be a viable option in the long run as the sanctuary is under tidal influx (ii) vegetation management such as thinning (cutting of branches) of canopy of the exotic trees (eg. *Samanea saman*) may be thought to make the area a little more open (iii) diversion of sewage canals to prevent entering of pollutants that make the substratum unsuitable for the growth of planktons and associate aquatic organism (iv) barricading the inlet canal to prevent entering of solid waste through the tidal canal and (v) regular monitoring of the soil and water quality, visit of water birds, monitoring of aquatic fauna and change of mangrove vegetation are suggested.

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Ecotoxicology

5



Monitoring and surveillance of environmental contaminants in birds in India

Mortality of birds due to contaminants has become of late more rampant in India. During 2014-2015 fifteen species of birds were received dead at the laboratory



from states, namely Gujarat, Tamil Nadu, Kerala and Karnataka. White Backed Vulture, Black Kite, Spotted Owllet and Saras Crane were the notable species. The study to monitor residue levels of persistent chemicals in birds and identify chemicals responsible for mortality of birds across the country has been an ongoing exercise.

Birds were collected dead on opportunistic basis. Multi residue method was followed for extraction and residues of pesticides were measured by Gas Chromatograph. Metals were estimated with Atomic Absorption Spectrophotometer - graphite furnace.

Pesticides: During the period under report, 120 birds comprising 35 species including the birds received during 2013-14 were analysed for a set of 19 Organochlorine (OC) pesticide residues. Accumulation pattern of OCs was in the order of DDT > HCH > Endosulfan > heptachlor, Dieldrin, Alachlor and dicofol. White-backed Vulture had the highest levels of DDT and HCH. While classifying them based on feeding guild, carnivores had the highest

accumulation followed by Piscivores and omnivores.

Heavy metals: Levels of copper, lead, chromium and cadmium in 25 species of birds collected from Gujarat were analysed. Analyses on other species of birds are being done. The pattern of accumulation differed among species, organs, feathers and metals. Indian Pond Heron had the highest level of total metal burden (4249.46 ppb) while in other species the levels ranged between 905 and 2631 ppb. Among tissues, accumulation was the highest in kidney (3313.14 ppb) followed by liver (2976.22 ppb). Amongst the four metals studied, levels of cadmium were the highest in both tissues and feathers. Accumulation of metals also differed among feeding guilds of the birds.



Environmental Impact Assessment

6



Study on the the potential environmental impacts of wind farm development in Agali, Attappadi, Kottathara and Nallasingam areas of Palakkad district, Kerala

The present rapid study of one month duration was taken up by SACON for Centre for Wind Energy Technology (CWET), Chennai, as a part of the DPR preparation for the proposed wind projects in Agali, Attappadi, Kottathara and Nallasingam areas of Palakkad district, Kerala by NHPC. The scope of the study includes a rapid assessment of the impact potential on birds, bats and other aspects of biodiversity if any from the proposed wind power

project primarily from the available secondary information.

A rapid survey of the proposed turbine sites was conducted. This report was prepared by compiling secondary data available because of the short duration. However, rapid surveys were conducted and opportunistic observations were also recorded from the study sites.

The available reports have been critically examined and a compiled list of species for the study site was made. Around 150 species of birds were reported from Attappadi Hills which includes 15 endemic species out of 24 in Western Ghats (Vijayan et al. 2008). According to Vijayan et al., (2008) Sholayoor areas have more bird diversity as compared to the Agali and Kottathara due to presence of evergreen patches. Attappadi is considered as an informal buffer zone bordering the Silent valley National Park and chances of wildlife movements will be high due to patchily distributed forest. Nilgiri Wood-Pigeon,



Landscape and topography changes seen around existing turbines of the area



Ficus tree in fruiting seen at the study site (may indicate an increased risk of bird movements in such sites).

Columba elphinstonii is a globally threatened Vulnerable species reported from this area.

Currently, the available information may not be sufficient enough to conclude on the exact magnitude and nature of impacts of wind farm on wildlife, however, the proposed areas of Agali, Attappadi, Kottathara and Nallasingam are mostly revenue/ agricultural lands with no sensitive flora/ fauna/ wildlife habitat of conservation importance involved, only minimal impact is expected from the proposed project. There is very little information available on the bat collision with wind turbine and bat mortality from India. There are also apprehensions that the ultrasonic sound from the moving blades of wind turbines can interfere with movement of eco-locating bats. Preliminary results from the SACON's ongoing research indicated that there is minimal risk to the avifauna from the collision with wind turbines.

Monitoring the impacts of Jangi wind power farm (91.8 MW) with special reference to birds and bats

The development of wind-energy is a vital component of the India-wide objective to increase the proportion of energy derived from renewable sources, thus helping to reduce the emission of greenhouse gases. However, considering the current pace and scale of wind power development proposals, the impacts on

following ToRs. 1) Documentation of bird and bat populations in and around the project sites, 2) Identification of roosting sites of bats and population estimations 3) Study the response of avifauna to wind turbines 4) Evaluate the impact of the project on Raptor roosting sites 5) Assess the mortality risk caused by wind turbines to avifauna 6) Prepare plans to mitigate the impacts. The methodology involved rigorous field studies following standard methods to study floristics, birds, nest and roost sites, flight height preference and patterns, bat activity monitoring, mortality searches, field evaluation of carcass,



View of Turbines in the study area

environment is a cause for concern and hence there is a pressing need for more information on the range of potential impacts of wind farms, from across landscapes and seasons. The study addressed the



Mortality record- Pallid Scops Owl (*Otus brucei*)

removal and search efficiency and bias.

The present study reports the presence of diverse bird fauna that include several species of conservation importance. The high avian species-richness recorded is attributable to the presence of diverse habitat types and also to the closeness of the region to the Western edge of the Central Asian migratory flyway of birds. Although studies elsewhere have reported that birds especially migratory species do not prefer wind turbine sites (Villegas-Patraca 2012), around 70 migratory bird species were recorded in the present study area. Species such as Black redstart, Blue throat, Booted warbler, Brahminy starling, Dusky craig Martin, Greater Coucal and Yellow throated sparrow were the only species found absent in the wind farm area compared to the control sites.

The findings indicate that wetlands within wind turbine sites still have conservation value since

diverse avifauna including threatened species were found to be using these wetlands. The results also indicated that birds generally tend to avoid turbine sites (wind farm area) for nesting purpose.

Although 173 species of birds recorded in the area, only 28% (49 species) of birds were found to be at high risk of collision with turbines. In general, raptors, doves and some waterbirds had maximum chance of collisions. The estimated mean annual mortality rates per turbine at the Genting Wind Farm at Jangi was 0.38 for birds and 0.28 for bats. This is very low rate compared with the reports from various other parts of the world. For instance, mean number of collision fatalities of up to 64 birds per turbine per year has been reported in a study of European wind farms. However, the report further recommended precautionary measures for further minimizing the avian mortality risk at the Jangi Wind Farm.

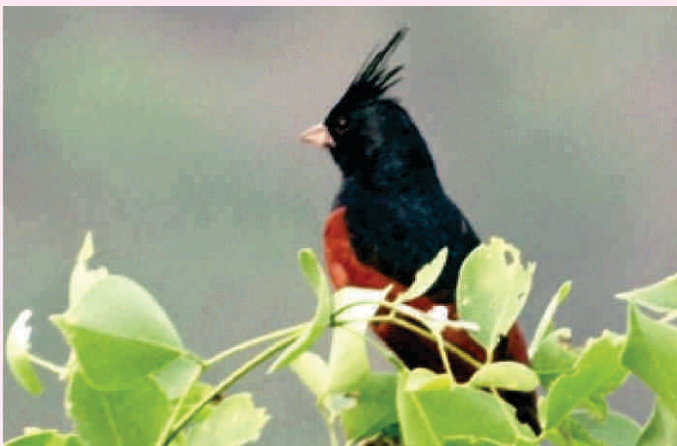
Cumulative impact assessment study of hydro power projects on River Yamuna, Tons and tributaries in Uttarakhand: Faunal Aspects

The High Court of Uttarakhand at Nainital vide its Order dated 15th July 2011 had asked Government of Uttarakhand to conduct a Cumulative Environmental Impact Assessment (cEIA) Study of Hydropower Projects on River Yamuna and Tons & its tributaries in Uttarakhand. Accordingly a study was assigned to Indian Council of Forestry Research and Education (ICFRE) through Uttarakhand Jal Vidhyut Nigam Limited (UJVNL) for conducting a cEIA in

collaboration with relevant expert organizations. Sálím Ali Centre for Ornithology and Natural History (SACON), was awarded with the faunal component of the study. Other partner institutions for the study were IIT Roorkee (for Hydrological aspects), Cold water Fisheries Research Institute (Fishes & Aquatic fauna) and ICFRE (Flora and social aspects)

The specific objectives of the study include inventory of avi-fauna, and other terrestrial fauna and evaluate their conservation status and threat perceptions from the Hydroelectric projects. Standard methodologies for faunal and floral sampling was followed to collect relevant data from the field along with secondary data sources. Time constrained Point counts, transect walks and opportunistic observations were mainly used for documenting the faunal elements.

During the present study 535 faunal species known to occur in the area were documented. Of this 276 species were recorded during our primary field surveys and an additional 259 species were compiled



Crested Bunting (*Melophus lathamii*)

based on various secondary information. This included one endangered species (Egyptian Vulture;



View of the waters of Rupin, an upstram tributary of Yamina

Neophron percnopterus) and one Vulnerable species (Pallas's Fish Eagle; *Haliaeetus leucoryphus*). The Rupin

and Supin sub-basins in the uppermost reaches of Tons river are located in the protected area of Govind National Park and Wildlife Sanctuary and it is very important habitat for wildlife including Snow leopard and pristine water sources for the downstream areas. Outside the protected areas, the Lakhwar and Vyasi project sites along Yamuna in Dehradun district was also found to have good amount of faunal diversity. As far as the endemic species are concerned, all the endemic species were represented exclusively in the upper reaches that encompasses the Govind National Park and Wildlife sanctuary. Hence, from the faunal aspect, it is recommended that the Protected Areas in the upper catchments should ideally be declared as no available areas for any kind of development for the long term survival of the wildlife wealth and to ensure sustainability of the ecosystem services to the downstream areas.

Impact of Hara wind power project of CLP Wind Farms (India) Ltd. on wildlife including migratory birds and raptors at Harapanahalli, Davangere, Karnataka

The present study was taken up further to the request from CLP Wind farms (India) PVT LTD to SACON to undertake a study about the 'impact of windmill on wildlife especially birds and bats and quantified the mortality risk.

The results indicated that wind turbines do cause bird mortalities in the CLP Wind farm area; however, the mortalities of birds are quite low while comparing

with other reported from elsewhere. Significantly higher number of bat carcasses compared to birds were recorded from this wind farm site. The annual mortality rate of birds and bats were estimated as 0.47 individuals/ turbine and 12 individuals/ turbine respectively. However, the bat mortalities recorded were comparatively higher than that of birds in the Hara wind farm which is contrary to reports from other Indian wind farm areas wherein higher bird mortalities were recorded. During the carcass search method we recorded seven dead birds but all were common resident birds only. It is likely that wind mills



along with the supporting structures like roads, power evacuation corridors, and other associated infrastructure impact birds and biodiversity. Nonetheless, the study could not find any evidence that indicate significant impacts on birds from the operations of CLP Hara Wind Farm. But the comparatively higher rate of mortality for bats posed by Hara Wind Farm needs closer monitoring over a long term basis.

Though the observed and estimated mortality rates of raptors, other birds and bats were not alarmingly high in the Hara Wind Farm, where it was found that the bats are at higher risk compared to birds. However it

needs further investigations to ascertain whether it is a function of the inherent difference in population densities of birds and bats in this area. Minimize the lighting around the turbines during night to minimize attracting the insects to the turbine sites and thus indirectly attracting nocturnal insectivorous birds and bat species. Forest department may be urged to intensify the fire control measures in the forests adjoining the Hara Wind Farm in order to minimize the influx of various faunal species to the relatively unburnt habitat areas available in the Wind Farm which might result in escalated risk of collision for the aerial faunal elements such as bats and birds.

Preparation of management plan for Fudam Bird Sanctuary, Diu

The Fudam Bird Sanctuary having an area of 2.18 sq.km. is situated in the Diu Island of the U.T. of Daman & Diu and is a rich habitat for the birds. It is interspersed with numerous creeks and mud flats. The final notification under Section 26 A (I) of the Wildlife Protection Act, 1972 in respect of this sanctuary was issued on 08/12/2006 by the Administration of Daman & Diu. Though certain habitat management activities have been carried out in the sanctuary from time to time, there is no approved management plan in place. Hence the forest department of Daman & Diu approached SACON to develop a management plan to facilitate the long term planning for the habitat management of the sanctuary.

The major objectives of this management plan are 1) to evaluate various issues related to opportunities and threats in the FBS for its ecological development and sustenance, 2) development of a management action plan 3) survey and assessment of Floral and Faunal Diversity of the sanctuary and preparation of

zonal action plan and theme plan for the management of the FBS along with necessary maps. Standard field methods for avifauna and wildlife and questionnaire surveys for socioeconomic data are being used for collecting the primary data, in addition to the secondary sources of information. Survey was carried out in Fudam Bird Sanctuary as well as in adjoining areas. Survey was conducted covering different available habitats such as Grasslands, Fresh water pools, Coastal areas, Human habitation, Forest area in Dagacha, Simbur Coast, and Fresh water wetlands in Gujarat side (Naliya Mandvi) etc. The efforts were distributed representatively in all the areas and each site was visited three times for repeated counts.



Panoramic view of the Fudam Bird Sanctuary



Flock of migratory Rosy Starlings at the Sanctuary

Field work has been completed, report is under preparation. Waiting for the comments from forest department. Detailed plans for Monitoring and Conservation of FBS and delineation of ecological buffer zone areas, infrastructure for ecotourism etc are being developed.

Plant- animal community studies in various landscape elements (Birds and Butterflies) in the Munnar High Range Mountain Landscape Area

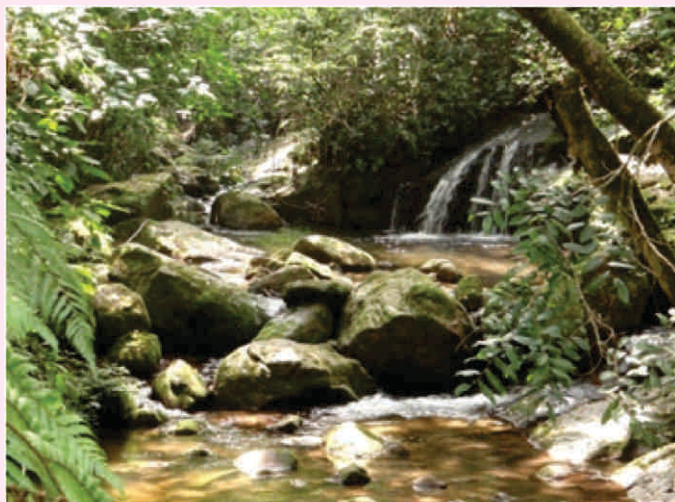
The project on plant- animal community studies in various landscape elements (Birds and Butterflies) in the Munnar High range Mountain Landscape Area, is envisaged as a joint project between SACON, and JNTBGRI, Thiruvananthapuram.

The project is aimed at studying the plant, bird and butterfly assemblages of various habitat/landscape elements within the HRML region and to evaluate the conservation importance of these communities including endemism, rarity, endangered and habitat specialization, patterns of assemblage and distribution of species across habits and gradients, delineation/ prioritization of conservation important areas with respect to targeted taxa, an objective analysis of the management issues that affect the community composition of plants, birds and butterflies and community specific conservation strategies to facilitate long-term sustainability of the wildlife species and associated ecosystem services in the HRML landscape.



Tea Plantations

The study will bring out a broad idea on the spatial patterns in the species assemblages and identify priority areas of conservation significance and viable management options taking lessons from the past experiences.



Anamudi Shola National Park

Detailed field surveys on identified landscape elements and taxa using standard methods adopting stratified random sampling where data gap is identified covering spatial and seasonal dimensions will be conducted. The sampling strategy will be finalized after the initial reconnaissance. It is expected that the detailed HRML area map depicting the whole study area would be made available for the use of all the projects for uniformity and better metadata compilation and meaningful geo-spatial interpretation of outputs from multiple projects.

Avian Physiology and Genetics

7



Identification of RNA transcripts present in chicken sperm and their relation to fertility

Sperm RNAs have the potential to serve as fertility bio-markers. However, research on sperm RNA is at slow pace because of lack of suitable species-specific sperm RNA isolation protocol. RNA isolation from sperm presents several challenges such as low RNA quantity (22–45 times less RNA) and removal of somatic cells. In addition, sperm are highly condensed cells, and there are differences among species in sperm attributes and chromatin packaging which makes cellular contents isolation further challenging. In this project a protocol for RNA isolation from chicken sperm and removal of somatic cells from semen is developed. Further, we encountered a problem in Protamine (PRM) gene amplification by PCR because of its high GC (88%) content. Protamine is expressed only in male germ cells and known as signature of sperm RNA. Therefore, a method for PCR amplification of PRM is developed during this study. The new method provides flexibility to the user to use either specific Taq Polymerase or normal Taq polymerase in combination with DMSO. A catalogue of chicken

sperm RNA is developed using microarray technique. A total of 3142 unique sperm enriched RNAs are found in chicken sperm (Fig. 1). A preliminary survey of the chicken sperm transcript profile for previously reported sperm RNA candidates identified several transcripts common in bovine, human, porcine and chicken. These transcripts showed differential expression pattern in chicken spermatozoa. Twenty least abundant probes based on the fold regulation in sperm RNA showed non-functional translational machinery in sperm. However, nineteen most abundant probes based on the fold regulation in sperm RNA are non-characterized.

In a normal broiler breeder flock approximately 30% male birds are of inherent low fertilization potential, which is enormous in terms of production loss. The important point is that low fertilization potential birds cannot be identified by evaluating conventional semen characteristics. Our results demonstrated an association of sperm PRM and PLCZ1 RNA quantity with fertilization potential. Birds with high fertilization

potential had three times more PRM and two times more PLCZ1 mRNA in their sperm compared to sperm of low fertilization potential birds (Fig. 2). To the best of our knowledge this is the first report of an association of PRM and PLCZ1 transcripts quantity with fertilization potential in birds. The two transcripts may be exploited as fertility bio-markers in birds for captive breeding programs.

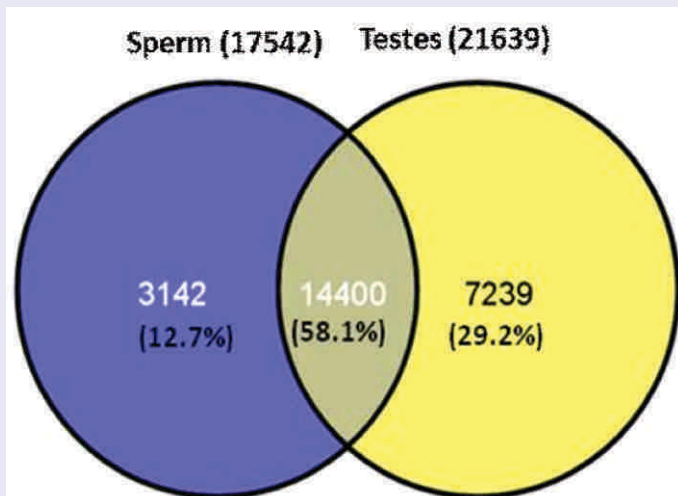


Figure 1: Venn diagram of the proportion of specific or common transcripts between testis and sperm with raw signal intensity greater than 50 by microarray analysis

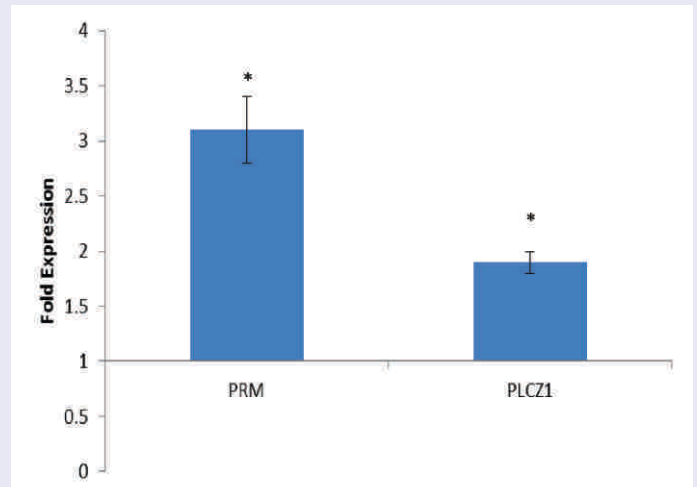


Figure 2: Relative expression of PRM and PLCZ1 in high fertility birds in relation to low fertility birds.

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Extension

8



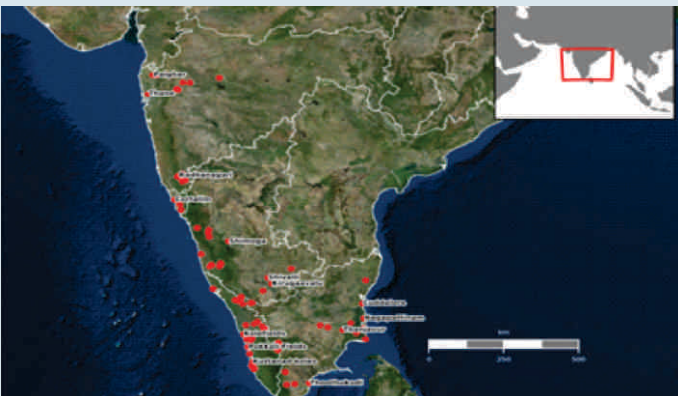
Ecological and ethno-cultural examination of the rise and fall in rice diversity in southern India with special reference to the Western Ghats

Rice paddies, unique in several ecological characteristics, provide invaluable and irreplaceable ecosystems services.

It is reported that till few decades back 50,000 to 60,000 rice varieties were cultivated in India. However it has come down to few hundred varieties now. Hence a study was undertaken with the objectives (i) to identify and document the diversity of the traditional rice varieties of Western Ghats and associated traditional knowledge, (ii) to identify

Important Rice Areas (IRAs) based on rice biodiversity, ecological status, agronomical practices, commercial and socio religious importance, (iii) to study the historical changes in rice cultivation practices and explore the reasons for the same, and (iv) to assess and compare the ecological values / services of rice / rice paddies, traditional vs. modern.

Our study could document information about 591 traditional varieties from 5 states. Out of this 141 are from Kerala, 122 from Tamil Nadu, 182 from Maharashtra, and 77 from Goa. Information regarding the cultural and religious and ritualistic aspects, agronomic practices related with each variety, and biodiversity in the paddy fields and surrounding areas were documented. One hundred and seventy three plant species, 57 bird species and 41 butterfly species from the paddy fields of Tamil Nadu, 144 plant, 189 bird, and 51 butterfly species from Kerala; 169 plant, 74 bird, 42 butterfly and 30 odonate species from Karnataka; 144 plant, 29 bird, 36 butterfly and 24



odonate species from Maharashtra and 7 odonate and 16 bird species from Goa were recorded.



Kuttand paddy ecosystem, Pokkali and Kole paddy ecosystem, hill areas of Wayanad, and Kanthalloor, Kerala, Cauvery delta basin in Tamil Nadu, Shimoga, Sagar, Medini areas in the Western Ghats of Karnataka, parts of Vikramgarh, Jawahar, Sangamner, Akole and Radhanagari Taluk in Maharashtra and the entire Khazan fields of Coastal area of Goa are identified as IRCA's. Samples of 125 varieties were collected for educational purposes.

Historical data on the rise and fall of paddy cultivation were collected. The data collected was mapped on a GIS Platform.

Special management and conservation action plans should be prepared and implemented for conserving the IRCA's identified, extension of governmental/institutional support to the individual and institutions involved in the conservation of traditional rice varieties, steps to ensure intellectual property rights of the communities who have conserved the numerous land races and networking of individuals and organizations involved in the cultivation/conservation of traditional varieties are the recommendations made based on the study.



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Wetland Ecology

9



SACON ENVIS Centre on Wetlands including inland wetlands

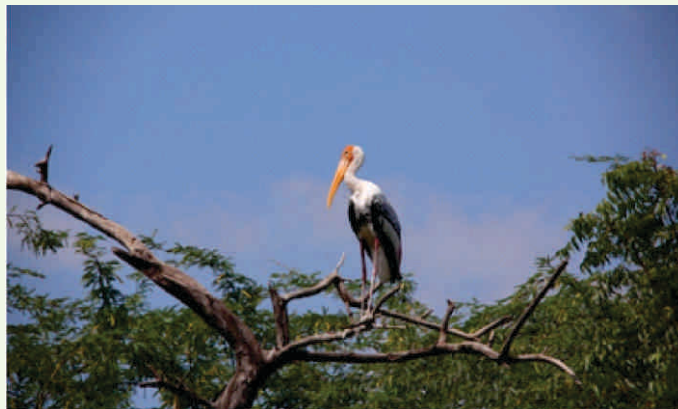
The SACON ENVIS centre on Wetlands including inland wetlands is an ongoing project of SACON sanctioned by the MoEF&CC since 2003. The Centre has been awarded 'A-grade' for the financial year 2014-15. During the past year we have created new databases for freshwater wetlands, high altitude wetlands, North East wetlands, mangroves, *Myristica* swamps, kids section and the associated aspects. The frequency of updating the website is minimum 50 per week. 30 new website links have been added to the existing ones. The website during April 2014 to March 2015 has had total hits of 13729 that include

3712 unique visitors. The centre has also responded to all the queries it has received. Published three issues of the "Sarovar Saurabh" SACONENVIS Newsletter, posters on the World Wetlands Day 2014, Wildlife Week and World Water Day. Posters on wetland species, contribution of SACON in the Andaman and Nicobar islands and a compilation of publications on CD on the wetland research has been prepared. Calendar on the Ramsar Sites and a book on the 'Lakes of Coimbatore city' has also been published. The team has attended two conferences viz. Indian Science Congress 2015, Mumbai and National seminar on conservation of wetlands for future at Palakkad, Kerala, and disbursed information on the ENVIS centre.

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Assessment of the morphological diversity and the ecological patterns in the near threatened colonial water birds across Indian sub-continent using novel approach

Heronry birds are widely distributed over the Indian subcontinent, and many of them namely, Black-headed Ibis *Threskiornis melanocephalus*, Painted Stork *Mycteria leucocephala*, and Oriental Darter *Anhinga melanogaster* have been included in Near Threatened by BirdLife International. However, ecological information on these colonial nesting birds are limited. Birds at the heronries provide an ideal place to videograph at close quarters. One of the main hurdles in studying morphometric in large birds is the difficulty with which the desired number of specimens can be captured or culled, due to restrictive laws and the IUCN status of the species. Therefore, one has to rely upon either museum specimens or chance encounters with dead specimens. However, it is possible to obtain reliable measurements of external characters in a wild population of birds by using innovative non-invasive field methods. Hence, the present study was designed to investigate the morphological patterns of Painted Stork *Mycteria leucocephala* at selected heronries in North and South India using a novel video graphic method.



Images of the individual birds were captured on a video camera and images were downloaded to computer, and then by incorporating appropriate correction factor, they were measured using specific software (tps 2.17). Since the video camera has not been calibrated with this software the dimensions estimated were initially in arbitrary units. These were later converted into metric units by the protocol described. The project results were summarized as two different themes a) standardization of camera and methods b) collections and analysis of images from North Indian and South Indian heronries.

Mahendiran Mylswamy, mahenrose@rediffmail.com



Nature Education

10



One day Nature Awareness Programmes

Twenty seven nature awareness programmes for students were conducted in the campus. 1437 students along with 98 teachers participated in these programmes. Each programme contained nature treks, field lectures, slideshows and interactive sessions.



Sálím Ali Trophy Nature Competitions

Annual inter-school competitions for the Salim Ali Trophy Nature Awareness were conducted on 8th February 2015. More than 3000 students from 55 schools participated in the competitions and 130 students from 21 schools won the prizes. G D Mat. Hr.

Sec. School, Coimbatore claimed the overall Rolling Trophy for the best school.

Sálím Ali Naturalist Forum (SANF)



SANF is a platform of nature education for all who love nature and wanted to contribute towards conservation of nature. SANF regularly conducts bird watching and trekking programmes in forests, wetlands and other natural ecosystems in and around Coimbatore. This year's annual meeting was held on 22nd June 2014 at SACON. On 19th July SANF meeting was held at Kothagiri, a special overnight programme in which members visited the Longwood shola forest. One or two bird watching programmes

and one meeting were conducted every month under this programme.

Invited Lecture

Mr. R.H. Khwaja IAS (Retd) former Secretary, Ministries of Coals and Mines, and Tourism and former Special Secretary of Ministry of Environment, Forest & Climate Change, delivered a special invited lecture. He spoke on the topic “Environmental Concerns and Strategies for Sustainable Development”. Prize distribution of the Salim Ali Nature Competitions were also conducted during the day.

HSBC Coimbatore Bird Race

SACON has organized, the fourth Coimbatore Bird Race, on 22nd February 2015, with the support of HSBC bank and Yuhina Eco-Media, Mumbai. Twenty registered teams with about 100 birdwatchers participated in the race covering as many bird habitats in and around the Coimbatore City. Some of the teams have members as old as seventy and many were smart budding bird watchers from the

Exploring nature through birds

Exploring Nature Through Birds (ENTB) is a science education programme executed in collaboration with many partners across the country. This programme is catalysed and supported by the National Council for Science and Technology and Communication of Department of Science and Technology, Government of India. Aim of this programme is to develop science communication module for ornithology and nurture careful observation and systematic documentation among students and teachers. At first, the programme developed an activity-based-learning module that could be used in class rooms as well as in field by students. Then a web portal is prepared and launched to connect and coordinate the teams working in various parts of the country. As part of the project, from the brain storming workshop held earlier, a module of education materials including three books, four posters and one CD were prepared. They were distributed to students, nature lovers and bird watchers. ENTB web portal has been designed and integrated with nature education website (www.saconeducation.org). Preliminary field visits for testing the module has been initiated in some schools in Coimbatore and Pollachi. In July, a meeting of five



schools was held at Pollachi to decide the role of each school and how they would proceed with the project. The school students visited SACON campus also on a one day nature camp to get introduced to the project formally. They were introduced to the method for recording and noting their findings. Field level activities are progressing. Since then from many parts of the country students and teachers have become active members in ENTB (www.saconeducation.org/entb) and uploading their observations on bird population, nesting, roosting and feeding activities.

P. Pramod, neosacon@gmail.com

ACADEMIC PROGRAMMES

ZOOLOGY

P Pramod	L Joseph Reginald	Ph D	Diversity and habitat preference of bats (Order Chiroptera) of Coimbatore	On going
	A P Zaibin	Ph D	Insular biogeography of Nicobar Islands from a bird community perspective	On going
	P Rajan	Ph D	Bird community of Andaman Island with emphasis on human associated and introduced birds	Awarded
	M Suhirta Muhil	Ph D	Ecology of Odonates in Coimbatore	On going
	S Srinidhi	Ph D	Assessment of Impact and Management Strategies of the Bird Hazards to Aircrafts in India.	On going
	J Chaithrashree	Ph D	Dynamics of biodiversity in paddy fields: A study of indicator communities	On going
	C Divyapriya	Ph D	Spatial and temporal variations of call & song repertoire in Common Iora in selected locations of Western Ghats	On going
Arun P R	Ramesh Kumar S	Ph D	Environmental Impacts of wind power generation with special reference to birds in Kutch District, Gujarat	On going
	Mohamed Samsoor Ali	Ph D	Waterbird Assemblage Of Human-Made Wetlands In Bhachau Taluk Kutch District, Gujarat, India	On going
	Santhakumar S B	Ph D	Impact of developmental activities on bird communities along Sutlej river basin, Himachal Pradesh	On going
	Anoop V	Ph D	Impacts of Wind power generation on select faunal components of a dry deciduous forest at Harpanahalli, Davangere	On going
S Manchi Shirish	Akshaya Mohan Mane	Ph D	Population dispersal studies of Edible nest Swiftlet in Andaman & Nicobar Islands, India	On going
H N Kumara	K Santhosh	Ph D	Status, ecology and conservation of Lion Tailed Macaque in Sirsi-Honnava forests of Western Ghats, Karnataka	On going
	Arijit Pal	Ph D	A study on reproductive behavior of Nicobar long tailed macaque (<i>Macaca fascicularis umbrosa</i>) in Nicobar Islands, India	On going
	Aditi Mukherjee	Ph D	Burrow use patterns by terrestrial vertebrates in Keoladeo National Park, Bharatpur, India	On going
	Avadhoot D Velnakar	Ph D	Population status and resource utilization of Nicobar long-tailed macaque <i>Macaca fascicularis umbrosa</i> in Nicobar Islands, India	On going
	Partha Sarathi Mishra	Ph D	Aggression and post-conflict affiliation in Nicobar long-tailed macaques <i>Macaca fascicularis umbrosa</i>	On going

BOTANY

P Balasubramanian	C Anbarasu	Ph D	Avian frugivory and seed dispersal in the shola forests of Nilgiris, Western Ghats, India.	Awarded
	P Manikandan	Ph D	Study on nest tree preferences by cavity nesting birds in the riverine forests of Athikadavu Valley, Western Ghats	On going

ENVIRONMENTAL SCIENCES

P A Azeez	J Ranjini	Ph D	Adaptation and tolerance of birds to urbanization – a critical evaluation with emphasis on life strategy	Submitted
	K A Nishad	Ph D	Usage and application of real time and continuous environmental data for climate change adaptation	On going
	R Chandran	Ph D	Environmental Education: Impact on Higher Education	On going
	J V Jins	Ph D	Reptile communities of Agasthiyamalai Hills, Western Ghats	On going
	Madhumita Panigrahi	Ph D	Bird communities of Agasthiyamalai Hills, Western Ghats	On going
	Mohd. Zeeshan Malik	Ph D	Assessment of environmental changes in three districts (Jammu, Rajouri & Ramban) representing altitudinal gradients in Jammu region.	On going
S Muralidharan	S Jayakumar	Ph D	Impact of agricultural pesticides on the population status and breeding success of select species of fish-eating birds in Tamil Nadu	Awarded
	K Ganesan	Ph D	Comparative study on pesticide residues in select components of an agro ecosystem adopting organic and chemical farming in Padayetti village, Palakkad District, Kerala	Submitted
	V Kirubhanandhini	Ph D	Levels of metal contamination in select species of birds	On going
	Mrs. Mythreyi Devarajan	Ph D	Impact of pesticides on select components of a rice field ecosystem	On going
	Mr. Aditya Roy Ashimkumar	Ph D	Effects of environmental contaminants on ecology and breeding biology of Gyps vultures	On going

Publications



National

Das, S., Dutta, S., Sen, S., Jijumon A. S., Babu, S., Kumara, H.N. and Singh, M. 2014. Identifying regions for conservation of sloth bears through occupancy modelling in north-eastern Karnataka, India. *Ursus*, 25: 111-120.

Dwevedi, R., Singh, S. K., & Krishna, V. 2014. Heronries of Mathura District, western Uttar Pradesh, India. *Indian BIRDS* 9 (4): 93-95.

Dilip Shenai and Goldin Quadros, 2014. Comparison between a manmade lake and a natural lake in Mumbai using select water quality parameters. *Ecology, Environment and Conservation*. 20(2): 777-782 pp

Jayakumar Samidurai, Babu Santhanakrishnan and Mahendiran Mayilsamy, 2014. Stray dog *Canis familiaris* preying on threatened birds in Vedanthangal Bird Sanctuary, Tamil Nadu ZOO'S PRINT Volume XXIX, Number 1 P. 32

Kumara, H.N., Sasi, R., Suganthasakthivel, R., Singh, M., Sushma, H.S., Ramachandran, K.K. and

Kaumanns, W. 2014. Distribution, demography and conservation of lion-tailed macaques (*Macaca silenus*) in the Anamalai Hills Landscape, Western Ghats, India. *International Journal of Primatology* 35: 976-989.

Kumara, H.N., Singh, M., Sharma, A.K., Santhosh, K. and Pal, A. 2014. Impact of forest fragment size on between-group encounters in lion-tailed macaques. *Primates*, 55: 543-548.

Kumara, H.N., Thorat, O., Santhosh, K., Sasi, R. and Ashwin, H.P. 2014. Small carnivores of Biligiri Rangaswamy Temple Tiger Reserve, Karnataka, India. *Journal of Threatened Taxa*, 6: 6534-6543.

Manchi S., Rahmani A. R. and Mukherjee D. 2014. Grey-faced Buzzard *Butastur indicus*: First record from India. *J. Bombay Nat. Hist. Soc.*, 111(1).

Muralidharan S., Ganesan K., Nambirajan K., Kirubhanandhini V and Dhananjayan V. 2015. Wetland birds-indicators of pesticides contamination current and future prospects for research in India. *Wildlife Institute of India, Dehradun, ENVIS Bulletin, Wildlife protected areas, "Water birds of India"*, 16. 315-323.

Nair, G. P., Balasubramanian, P., Jaishankar, R., Sarojkumar, V and Sooraj, N. P. 2014. Taxonomy and Ethnobotany of Sthalavrikshas (Temple Trees) in Palakkad, Kerala, India. *Science and Culture*, Vol : 80 : 103-105

Praveen, J., R. Jayapal, and A. Pittie. 2014. Notes on Indian rarities-2: Waterfowl, diving waterbirds, and gulls and terns. *Indian Birds*, 9: 113-136.

Sasi, R. and Kumara, H.N. 2014. Distribution and Relative Abundance of the Slender Loris *Loris lydekkerianus* in Southern Kerala, India. *Primate Conservation*, 28: 165-170.

Shafeeque C.M., Sharma S. K., Sastry K V H., Mohan J., Singh R. P 2014. Sperm RNA: a new class of fertility biomarkers for birds. *Advances in Animal and Veterinary Sciences*, 2(3): 155-158.

Shafeeque C.M., Singh R. P, Sharma S. K., Mohan J., Sastry K V H., G. Kolluri, V.K. Saxena, Tyagi J S., Kataria J M., Azeez P.A. 2014. Development of a new method for sperm RNA purification in the chicken. *Animal Reproduction Science*, 149: 259-265.

Shafeeque C.M., Singh R. P., Sharma S. K., Mohan J., Sastry K V H., Kolluri G., Saxena V K., Tyagi J S., Kataria J M., Azeez P.A., 2015. Chicken sperm transcriptome profiling by microarray. *Animal Reproduction Science* (under revision).

Sharma S. K., C.M. Shafeeque, Mohan J., Azeez P.A., R.P. Singh 2014. PCR amplification protocol for GC rich protamine gene from chicken testis cDNA. *Advances in Animal and Veterinary Sciences*, 2(11): 599-605.

Singh R. P, C.M. Shafeeque, Sharma S. K., N.K. Pandey, R. Singh, Mohan J., G. Kolluri, M. Saxena, B. Sharma, Sastry K V H., Kataria J M., Azeez P.A. 2015. Bisphenol A reduces fertilizing ability and motility by compromising mitochondrial function of sperm. *Environmental Toxicology and Chemistry*, doi: 10.1002/etc.2957.

Sushma, H.S., Mann, R, Kumara, H.N. and Udhayan, A. 2014. Population Status of the Endangered Lion-tailed Macaque *Macaca silenus* in Kalakad-Mundanthurai Tiger Reserve, Western Ghats, India. *Primate Conservation*, 28: 171-178.

International

Aruna, R and Balasubramanian, P. 2014. Fruiting phenology and avian frugivory of *Streblus asper* Lour in a mixed dry deciduous forest, Western Ghats, India, *International Letters of Natural Sciences* 17:16-21.

Ganesan K., Chandrasekar K., Nambirajan K., Muralidharan S. 2014. Pesticide Residues in Two Frog Species in a Paddy Agroecosystem in Palakkad District, Kerala, India. *Bulletin of Environmental Contamination and Toxicology*, 93(6): 728-734.

Jins, V.J., Bhupathy, S. & Panigrahi, M. 2014. New record of Beddome's coral snake *Calliophis beddomei* Smith, 1943 from the southern Western Ghats, India. *Herpetology Notes*. 7: 555-557.

Manchi, S. and R Sankaran. 2014. Effect of Protection on White-nest Swiftlet *Collocalia fuciphaga* in Andaman Islands, India- an assessment. *Oryx* 48(2): 213-217.

Murugesan, M., Arun, P.R., Nikhil Raj PP, Azeez PA, and Sebastian M K. (Accepted). "A New Species of Sonerilla (Melastomataceae) from the Western Ghats of Kerala, India." *Nordic Journal of Botany*.

Ramesh, C., Shantha Kumar, S.B., Arun, P.R., Sony, R.K, Murugesan, M., and Bhupathy, S. 2015 (Accepted). "Further Confirmation for *Platycephalus rhodorachis* (JAN, 1865), from India, with a Note on Feeding on *Cyrtodactylus fasciolatus* (BlyTH, 1861)." *Herpetozoa* 1 (2).

Sony, R.K, and Arun, P.R. 2015. (Accepted) "A Case Study of Butterfly Road Kills from Anaikatty Hills, Western Ghats, India." *Journal of Threatened Taxa*.

Short communication

Jayakumar S., Muralidharan S. and Babu S. 2014. Hitherto unrecorded sighting of the Common Pochard *Aythya ferina* (Linnaeus, 1758) (Aves: Anseriformes: Anatidae) in Vedanthangal Bird Sanctuary, Tamil Nadu, India. *Journal of threatened Taxa*, 6(11), 3485-3487.

Papers in conferences / seminar/ proceedings / edited volumes

Akshaya M. Mane & Manchi Shirish S. 2014. Participatory approach towards species conservation

and livelihood generation in Andaman Islands, India: A Case-study, in Society for Conservation Biology Fiji 2014. Conference on Resilient Island Ecosystem and Communities held in Suva, Fiji from 9th to 11th July 2014.

Anbarasu, C and Balasubramanian, P. 2015. Role of birds in Shola forest regeneration in workshop on reclamation, revegetation at Topslip, Tamil Nadu Forest Department and restoration of fragmented sholas in Valparai Plateau, Anamalai Tiger Reserve. 6th January 2015.

Anbarasu, C., Prakash, L. and Balasubramanian, P. 2014. Some interesting fern species from Gudalur Forest Division, Western Ghats, 24th Annual Conference of IAAT and International conference on trends in plant systematics.

Hemambika B, Julffia B, Kirubhanandhini V, Babu S, Mahendiran M, Goldin Q, 2014. Diversity of birds from the Urban wetlands of Coimbatore, Tamil Nadu, India. National Conference on Modern Trends in Zoological Research, 25- 26 March, Thrissur, Kerala.

Karunakaran, P V. Western Ghats: A perspective on Biodiversity Conservation and Management. National Seminar on Green Living for Sustainable Development. October 16-17 2014. Govt. Brennen College, Thalassery.

Mahendiran, M, Rajneesh D and Azeez P.A.2015. Use of long term monitoring programme for estimating the casual relationship among the heronry birds and water availability in Keoladeo National Park. National Conference, 28 Feb 2015 at Keoladev National Park, Rajasthan.

Mahendiran M and Azeez PA 2015. Birds, habitat services, unsung functional Values. (Eds. Thivakaran, Mahoto and Gajera) Dryland Birds: Strategy for Conservation and Management. Proceedings of the National symposium, Gujarat Institute of Desert Ecology, Gujarat.

Muralidharan S. "Pesticides and Birds: From Legendary DDT to Today's Poisons". In proceedings of the Seminar on "Recent Trends & Future Advances in Life Science (RTFLS)", Central University of Tamil Nadu Thiruvavur, 26th to 27th February.

Prakash, L., Anbarasu, C., and Balasubramanian, P. 2014. Some ecological observations on the orchids of Sathyamangalam Tiger Reserve, p 47 in : 3rd Indian Biodiversity Congress, " Biodiversity for Poverty Eradication". at SRM University, Chennai, 17-20 December 2014

Popular Article

Manchi Shirish S. 2014. WILD-O-PEDIA, SAEVUS, Vol-3 (6): Pp-26-29

Sebastian, M K & Azeez P.A.2014. Oduku ; Jaiva Krishikku Inangniya oru jaiva keeda nashini (Malayalam), Harithabhoomi, Vol.5(9), 6-10

Sebastian, M K & Azeez P.A. 2015. Jaiva Krishikku Inangniya Parambaragatha Nellinangal (Malayalam). Harithabhoomi, Vol.5(8), 15-16

Talks/Lectures Delivered

Balasubramanian, P. Birds and biodiversity conservation at Tamil Nadu Forest Academy, 5th Nov, 2014.

Balasubramanian, P. Guest Lecture on Afforestation by Avifaunal frugivory given at NGM College, Pollachi, 19 September 2014.

Balasubramanian, P. Guest Lecture on Ecology of seed dispersal by birds at the Botany Department, Vivekananda College of Arts and Science for Women, Tiruchengodu, 15 September 2014.

Balasubramanian, P. Plant-animal interactions with special reference to pollinators and seed dispersers, delivered at the Kongunadu Arts and Science College, Coimbatore. 12 March 2015.

Balasubramanian, P. PSGR Krishnammal College, Lecture and birding organized. 6 January 2015 Coimbatore.

Jayapal, R. Delivered a series of lectures and conducted field-practicals in avian ecology and biology as part of the Ornithology Module to the students of MSc (Wildlife Biology & Conservation), National Centre for Biological Sciences (NCBS) at Periyar Tiger Reserve, Kerala during 23-27 October, 2014.

Jayapal, R. Delivered a series of lectures and conducted field-practicals in ornithology and avian ecology at the Second DST-SERB School in Avian Biology organized by Gurukula Kangri Vishwavidyalaya, Haridwar, Uttarakhand during 9-17 March, 2015.

Jayapal, R. Delivered a talk on "eBird: A Citizen Science initiative to crowd-source data on bird populations" at the 'Exploring Nature Through Birds' workshop conducted by Nature Education Division at SACON on 13th August, 2014.

Karunakaran PV. "Landscape Ecology- an approach for Natural Resource Management" – lecture class at Academic Staff College, Calicut University on 22 July 2014.

Karunakaran PV. "Western Ghats as a Bioresource" talk delivered to ECOLOGUE-an assemblage of media persons at Thattekkad Bird Sanctuary on 4 May 2014.

Karunakaran PV. Talk on "Biodiversity Conservation" on the occasion of inauguration of Eco Club at Kendriya Vidyalaya, Kannur on 24 April 2014.

Karunakaran PV. "Mapping RET species" talk delivered as part of Faculty Improvement Programme at PSG College, Coimbatore on 27 September 2014.

Workshops/Seminars/Conferences attended

Balasubramanian, P. Attended one day workshop on "Establishing long-term monitoring vegetation plots" KFRI, Peechi. 1st October 2014.

Goldin Quadros. Indian Science Congress 2nd to 7th January, 2015, Mumbai University, Mumbai.

Goldin Quadros. National Consultation workshop on wetlands - 8th August, 2014, New Delhi organized by MoEF & CC and Wetlands International.

Goldin Quadros. National Seminar on Conservation of wetlands for Future, 25th February, 2015, Mercy college, Palakkad, Kerala

Goldin Quadros. Strategic Environment Assessment workshop 1st to 5th September, 2014 organised by GIZ and WII

Goldin Quadros. World Wetland Day seminar 2nd February, 2015 organised by Forest Department and MoEF & CC at Nalsarovar, Gujarat.

Jayakumar S. and Muralidharan S. "Diversity and Richness of water birds in select wetlands of Tamil Nadu". In proceedings of "Third Indian biodiversity congress (IBC)", Organized by School of Public Health SRM University Chennai, 18th to 20th December

Jayapal, R. Attended the XXVIII Annual Research Seminar at the Wildlife Institute of India, Dehradun during 21-22 August, 2014.

Muralidharan S. "Pesticides - The banes the future hold". In proceedings of National Conference on "Impact of climate change on environment and biodiversity" in Sri Paramakalyani Centre for Excellence in Environmental Sciences Alwarkurichi, Tamil Nadu, 26th and 27th March.

Muralidharan S. 2015. "Fish-eating birds: indicators of contamination status in select wetlands in Tamil Nadu", In proceedings of "National consultative workshop on restoring wetlands of Tamil Nadu", organized by Tamil Nadu Forest Department, Chennai, held on 2nd and 3rd February.

Santhosh, K., and Kumara H.N. "Practicing Science in Conservation: The lion-tales of Kanara" at 16th Student Conference on Conservation Science in University of Cambridge, United Kingdom. 24-26 March 2015

Meetings

Balasubramanian, P. Attended 2nd Orientation Meeting on conservation of threatened plant taxa in Tamil Nadu at Tamil Nadu Forest academy, Coimbatore, 1 July 2014.

Balasubramanian, P. Board of Studies, PG Syllabus meeting at Vellalar College for women at Erode, 26 April 2014.

Balasubramanian, P. National Seminar on biodiversity conservation organized by the Environmental Sciences Department at Bharathiar University, Coimbatore, 31st March 2015.

Jayapal, R. Attended the 1st and 2nd meetings of the National Planning Committee of the Second DST-SERB School in Avian Biology at Gurukula Kangri Vishwavidyalaya, Haridwar, Uttarakhand during 1-2 November, 2014 and 17-18 January, 2015 respectively.

Reports

Arun, P R, and Rajan, P. 2014. "Study on the Potential Environmental Impacts of Wind Farm Development in Agali, Attapadi, Kottathara and Nallasingam Areas of Palakkad District, Kerala." Technical report, SACON.

Arun, P.R., Murugesan M, Shantha Kumar, S.B., Sony, R.K, and Ramesh, C. 2014. "Cumulative Environmental Impact Assessment of Hydro Electric Projects of Sutlej River Basin in Himachal Pradesh-Faunal Aspects." Technical report, SACON.

Arun, P.R., Samsoor Ali, A M, and Ramesh Kumar, S. 2014. "Monitoring the Impacts of Jangi Wind Power Farm (91.8 MW) with Special Reference to Birds and Bats." Technical report, SACON.

Arun, PR, and Rajan, P. 2014. "Impact Assessment of Prospecting Exploration through 3D Seismic Data Acquisition by Oil India Ltd. on Mangrove Fauna at Kakinada, Andhra Pradesh." Technical report, SACON.

Balasubramanian, P and Silambarasan, S. 2015. Monitoring bird diversity and abundance in the Vellode Bird Sanctuary, Erode. Project Report.

Balasubramanian, P., Prasad, S. N. 2015. Biodiversity assessment for environmental monitoring of medium/minor irrigation schemes in Andhra Pradesh, Final Report.

Sebastian M K., Azeez PA, Chaithra Shree, J, and Arun, P.R. 2014. "Ecological and Ethno-Cultural Examination of the Rise and Fall in Rice Biodiversity in Southern India With Special Reference to The Western Ghats." Technical report, SACON.

Awards & Fellowships:

Dr. P. Pramod, Senior Scientist received the Fulbright Nehru Award for Academic Professional Excellence 2014. This award is being given to a selected group of academicians every year. Using this award, he has worked in Michigan State University and MSU Museum as a visiting scientist in association with Dr. Pamela C. Rasmussen. During this period he has also visited and delivered lectures in many universities such as Cornell's Lab of Ornithology, Ithaca, Smithsonian Museum of Natural History, Washington, American Museum of Natural History, New York, University of Chicago, University of South Florida, University of Wisconsin, University of Michigan, Ann Harbor, Princeton University, New Jersey, Duke University, Durham, University of Massachusetts and Harvard University, Boston.

R. P. Singh, Scientist- Avian Physiology and Genetics, was awarded INSA Medal for Young Scientist- 2014 by India National Science Academy. Dr Singh was also awarded Fulbright-Nehru Research Fellowship by United States-India Education Foundation and is currently working with Smithsonian Conservation Biology Institute, Museum of Natural History, Front Royal, VA, USA.

Workshops, Conferences, Training Programmes



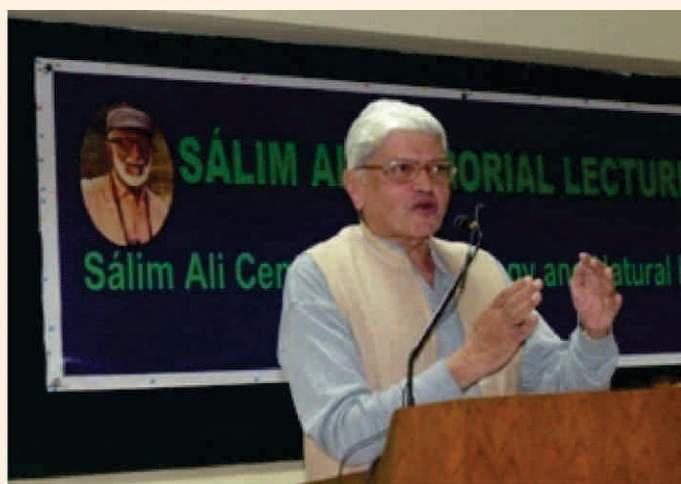
SÁLIM ALI MEMORIAL LECTURE-2014

Shri Gopalkrishna Gandhi, former Governor of West Bengal and a noted political analyst and writer delivered the 17th Sálím Ali Memorial Lecture on 28th November 2014 at Champion Hall, Central Academy for State Forest Service (Forest College

annual event of SACON, which aims at creating awareness, on nature conservation and natural history, among people of different walks of life.

This year, the Sálím Ali Memorial Lecture was opened with a video message by Shri. Prakash Javadekar, Hon'ble Minister of State (I/C) for Environment, Forests and Climate Change, Government of India, who is also the President of the SACON Society. In his message, the Hon'ble Minister congratulated SACON on its contributions to nature conservation and admired the annual Sálím Ali Memorial Lecture event for its role in spreading the message of nature conservation among the public.

At the outset, Shri Gandhi paid glowing tributes to Dr Sálím Ali highlighting his stellar contributions to ornithology and conservation in India. He recollected his interactions with Dr Sálím Ali during his tenure as District Collector at Pudukottai when Dr Salim Ali visited the place to help the forest officials to conduct a bird survey.



Campus, Coimbatore). The theme of his vibrant lecture was "Nature in Thirukkural". The memorial lecture, delivered by an eminent personality, is an

Dr K Gurumurthy former Director, Institute of Forest Genetics and Tree Breeding, Coimbatore, presided over the function and spoke about Sálim Ali and his pursuit for knowledge on birds. Dr T S Ashok Kumar IFS, Principal, Central Academy for State Forest Service felicitated the function highlighting the dedication and commitment of Dr Sálim Ali for the cause of ornithology and said that the youngsters

have a lot to learn from his life and deeds.

Dr P A Azeez (Director, SACON) welcomed the gathering, and Dr P V Karunakaran (Principal Scientist, SACON) gave vote of thanks.

The lecture was attended by researchers, forest officers, teachers, NGO representatives, academicians, activists, students, scientists, and public.

Training course on Instrumentation and Analytical Techniques

Training course on "Instrumentation and Analytical Techniques" was organized between 16 and 20 March 2015 by the Division of Ecotoxicology at SACON. Dr. P.V.L Rao, Director, DRDO, Centre for Life Sciences, Bharathiar University, Coimbatore inaugurated the programme. Researchers from Boston University, USA, National Institute of Advanced Studies (NIAS), Pondicherry University, Avinashilingam University, SACON and Classic Polo Industry, Tirupur participated in the programme. During the five-day-long programme, trainees were exposed to the basic principles and working mechanism of analytical



instruments, namely Gas Chromatograph, High Performance Liquid Chromatograph, Atomic Absorption Spectrophotometer, UV Spectrophotometer and Ultracentrifuge.

Summer Training Course

Summer Training course on "Laboratory Procedures on Ecotoxicological Studies" was organized during May and June 2014 by the Division of Ecotoxicology. Seventeen UG and PG students from various institutions (PSG College of Arts and Science, Central University of Tamil Nadu, Periyar University, Avinashilingam University, Shri Narayana Guru College and Madurai Kamaraj University) attended this programme. During this programme, they were given hands-on training on analytical instruments and were also taught laboratory procedures, basic principles and general working protocols adopted in ecotoxicological studies.

Infrastructure



SACON campus at Anaikatty with the backdrop of the Western Ghats, one of the 'hot spots' of biodiversity in the world, offers great opportunities for long-term studies on various aspects of its varied avifauna, other wildlife and on biological principles involved in the functioning of ecosystems. The tri-junction of Kerala, Tamil Nadu and Karnataka in the Western Ghats, one of the best wildlife areas in the country, is only a few hours' drive away. SACON sets up field stations in various parts of the country according to the requirements of the research projects.

As advised by the Governing Council, we have created two shallow static water tanks each 4500 liters capacity in the SACON campus to cater to the needs of birds and wild animals. These strategically located water bodies are being utilized by elephants, spotted deer, wild boar, wild gaur, and various birds. The tanks are connected with fresh water supply for everyday replenishment.

Laboratory: Currently, our laboratory is equipped with 1) UV-Vis Spectrophotometer, Perkin Elmer Model Lambda 35, 2) HPLC Agilent Technology Model 1100



series with DAD and Florescence detector, 3) Water Quality analyzer - Multi Parameter TROLL - 9500, Portable PC testr35, Eutech instruments, 4) Ultra Deep Freezer (-80°C), New Brunswick, Model U 410 Premium, 5) Deep freezers (-20°C), Carrier, Model CHP-30, Cryo Make, and refrigerators Model LG and Samsung, 6) Flame Atomic Absorption Spectrophotometer (AAS) Perkin Elmer, Model 3300 with 13 lamps, 7) Mercury Hydride Generator, Perkin Elmer, 8) Gas Chromatograph, Hewlett Packard Model 5890 Series II with three detectors, (Electron Capture Detector - ECD, Nitrogen Phosphorous Detector - NPD and Flame Photometric Detector -

FPD), 9) ANG generator, Claind, Model ANG 2381HC, 10) Microwave Digestion System, Milestone Model 1200, 11) Dissolved Oxygen (DO) Analyzer, 12) Biochemical Oxygen Demand (BOD) Incubator, Sanyo Model Mir 154, 13) Flame Photometer, Systronics 128, 14) Vertical Laminar Flow Chambers, 15) Respirable Dust Samplers, 16) Ultra Centrifuge, 17) Microprocessor research centrifuge, 18) Walk-in cold room, 19) Rotary Flask Evaporator Model Cyberlab RE-10, 20) Micrometer, 21) Digital Camera, 22) Thermo-hygrometer, 23) All Quartz Double Distillation unit, 24) Millipore water purification system, 25) Hot-air Oven, 26) Binoculars, 27) Induction Hot Plate, 28) Digital Caliper, 29) Soxhlet Mantle, (30)

Ultrasonic water bath, Crest 275, 2.7 lts, 31) Desiccators, 32) Blenders, 33) Rotary spinner, and 34) Inverted microscope.

Library and documentation: SACON library has 3263 Books, 2508 Back Volumes, 2706 Maps, 91 CD/DVDs, 101 Project Technical Reports, 34 PhD Thesis, 62 Current Periodicals {62 (National - 40; International - 22)}, Online Subscription of JSTOR Archive: Biological Science. Facility for literature searches has been provided to all the staff and students. As in the previous years, the library facilities were used also by students, scholars and scientists from other institutions in and around the Coimbatore.

ANNEXURE : LIST OF PROJECTS

No.	Project title	Investigator (s)	Collaborating agencies	Research Fellows	Duration	Budget (Rs.)	Funding source	Date of commencement	Date of completion	Current status
1	Identification of RNA transcripts present in chicken sperm and their relation to fertility	Dr. Ram Pratap Singh	Central Avian Research Institute, Izatnagar 243 122, Bareilly, India	Shafeeque	3 years	21,00,000/-	Department of Science and Technology, Government of India	Jul - 2012	Aug - 2014	Completed
2	Conservation of the Endangered Species and Habitats - The Edible-nest Swiftlet in the Andaman and Nicobar Islands	Dr. Manchi Shirish S	Environment and Forests, Andaman and Nicobar Islands	Akshaya M Mane	1.5 Years	21,40,400/-	Ministry of Environment Forest & Climate Change, Govt. of India	Apr - 2014	Aug - 2015	Ongoing
3	Conservation of the Andaman Serpent-eagle <i>Spilornis elgini</i> in the Andaman Islands : Phase - I	Dr. Manchi Shirish S	Environment and Forests, Andaman and Nicobar Islands	Shivkumari Patel	2 years	11,56,500/-	Raptor Research and Conservation Foundation, Mumbai	Dec - 2014	Dec - 2016	Ongoing
4	Status, Ecology and Conservation of Narcondam Hornbill <i>Aceros narcondami</i> on Narcondam Island, India	Dr. Manchi Shirish S	Environment and Forests, Andaman and Nicobar Islands	—	1.5 years	6,07,200/-	Environment and Forests, Andaman and Nicobar Islands	May - 2011	Mar - 2015	Final Report to be submitted
5	Patterns of Distribution of Selected Faunal Groups in the Agasthiamalai Hills, Western Ghats, Kerala, India	Dr. S. Bhupathy (01-10-2013 to 28-04-2014) & Dr. Rajah Jayapal (19-06-2014 to 31-12-2014), Dr. Lalitha Vijayan	—	Jins, J V and Madhumita Panigrahi	3 years	24,90,000/-	Department of Biotechnology Govt. of India	Aug - 2011	Dec - 2014	Final draft report submitted to DBT for approval

6	Spatio-temporal burrow use patterns by vertebrates in Keoladeo National Park, Bharatpur, Rajasthan, India	Dr. S. Bhupathy (Late)/ Honnavalli N. Kumara (From 30/07/2014), Dr. Manchi Shirish S	—	Aditi Mukherjee	3 years	Rs. 42,61,000/-	Dept. of Science and Technology, Govt. of India	Jun - 2013	Jun - 2016	Ongoing
7	Determining the taxonomic and conservation status of the Forest Owlet (<i>Heteroglaux blewitti</i>).	Dr. Shomita Mukherjee, Dr Robin Vijayan and Dr Prachi Mehta	National Centre for Biological Sciences, Bangalore and Wildlife Research and Conservation Society, Pune.	Pankaj Koparde	3 years	30,52,000/-	Department of Biotechnology, Govt. of India	Apr - 2013	Mar - 2016	Ongoing
8	Ecological species sorting in relation to habitat structure in the small cat guild of Eaglenest Wildlife Sanctuary, Arunachal Pradesh.	Dr. Shomita Mukherjee, Dr PV Karunakaran, Dr Ramana Athreya	Indian Institute of Science Education and Research, Pune	To be recruited	3 years	48,08,000/-	Dept. of Science and Technology, Govt. of India	Nov - 2013	Oct - 2016	Ongoing
9	Social organization, behaviour and phylogeography of <i>Macaca fascicularis umbrosa</i> on the Nicobar Islands, India	Dr. Honnavalli N. Kumara Prof. Mewa Singh & Dr. Shomita Mukherjee	CES, Bangalore	Mr. S. Vinodh, Mr. Partha Sarathi Misra and Mr Avadhoot D. Velankar	3 years	38,54,000/-	Science and Engineering Research Board (DST)	Jul - 2012	Jul - 2015	Ongoing
10	Ecological investigation of woody vegetation and nest tree use by birds in the riverine forests of Athikkadavu Valley, Western Ghats	Dr. P. Balasubramanian	—	P Manikandan	3 years	10,72,000/-	MoEF&CC, Govt. of India.	Apr - 2012	Mar - 2015	Completed

11	Status and distribution surveys of selected threatened plant taxa in Tamil Nadu	Dr. P. Balasubramanian	—	C. Anbarasu and L. Prakash	1.5 years	5,27,000/-	Tamil Nadu Forest Department	Aug - 2013	Mar - 2015	Completed
12	Study on ecosystem requirements of hornbills (Great pied, Malabar pied, Indian grey and Malabar grey) in Munnar Landscape Project Area	Dr. P. Balasubramanian, Dr. P.V.Karunakaran	—	L. Prakash and Mohamed Ibrahim N	1 year	10,36,000/-	UNDP	Jan - 2015	Dec - 2015	Ongoing
13	Preparation of site specific ecorestoration protocol based on existing community requirements	Dr. P.V.Karunakaran Dr. M.K. Sebastian	—	S Nagendran & Anoop NR	1 year	17, 73, 000/-	UNDP	Jan - 2015	Dec - 2015	Ongoing
14	Landuse and management plan for production landscapes	Dr. P.V.Karunakaran Dr. M.K. Sebastian	—	G Uma, V Gayathri & E Adhavan	1 year	22,50,000/-	UNDP	Jan - 2015	Dec - 2015	Ongoing
15	Habitat Assessment of Mangalavanam Bird Sanctuary	Dr. P.V.Karunakaran, Dr. Rajah Jayapal & Dr. A K Prusty	—	Manish Kumar	1 year	80,000/-	Forest & Wildlife Department Kerala	Mar - 2014	Feb - 2015	Completed

16	Monitoring and Surveillance of Environmental Contaminants in Birds in India	Dr. S. Muralidharan	—	K. Ganesan, K. Nambirajan Ms. V. Kirubha nandhini	3 years	48, 36, 000/-	MoEF, Govt. of India	Mar - 2010	Aug - 2014	Completed
17	Study on the the potential environmental impacts of wind farm development in Agali, Attapadi, Kottathara and Nallasingam areas of Palakkad district, Kerala	Dr. P. R. Arun	-	Rajan, P	1 month	2,15,000/-	CWET, Chennai	Apr - 2014	May - 2014	Completed
18	Preparation of management plan of Fudam Bird Sanctuary, Diu	Dr. P. R. Arun Dr Rajah Jayapal	-	Rajan, P	6 Months	7,00,000/-	U T Admin of Daman & Diu	Apr - 2014	July - 2015	Ongoing
19	Plant- Animal Community Studies in Various Landscape Elements (Birds and Butterflies) in the Munnar High range Mountain Landscape Area	Dr. P. R. Arun Karunakaran P V & Balakrishnan P	-	Ramesh Kumar, S., Anoop Raj, N & Ramarajan, N.	1 Year	24,90,000/-	UNDP	Dec - 2014	Jan - 2016	Ongoing
20	Monitoring the impacts of Jangi Wind power farm (91.8 MW) with special reference to birds and bats	Dr. P. R. Arun	-	Mr. Samsoor Ali and Mr. Ramesh Kumar	3 years	58,33,000/-	M/s Genting Energy	July - 2011	Dec - 2014	Completed

21	Cumulative Impact Assessment study of Hydro Power Projects on river Yamuna, Tons and tributaries (UK)- Faunal aspects	Dr. P. R. Arun	-	Dr. G. Srinivas and Mr. Shantha kumar	18 months	43,23,000/-	Uttarakhand Jal Board	Jan - 2013	Jun - 2014	Completed
22	Study of Impact of Wind power project on wildlife including migratory birds and roosting of Raptors, Davangere, Karnataka	Dr. P. R. Arun	-	Mr. V. Anoop	14 months	16,46,000/-	CLP, Wind Farms	Nov - 2013	Jan - 2014	Completed
23	Owl Assemblage and occupancy in Andaman archipelago, India	Dr S Babu Dr. H.N. Kumara	-	Mr. S Suresh Marimuthu and Mr. N Rajesh kumar	3 years	41, 17,000/-	Science and Engineering Research Board (DST)	Jun - 2013	Jun - 2016	Ongoing
24	Assessing the status and distribution of avifauna within in the coastal talukas of Sindhudurg district, Maharashtra	Dr S Babu Dr Goldin Quadros	-	Mr G Babu Rao, Mr Amit J Patil, Mr Bhupendra B Shirke & Mr Rajan Surve	2 Years	31,32,000/-	GOI-UNDP- GEF-Mangrove Cell, Mumbai	Sep - 2014	Sep-2016	Ongoing
25	Ecological and ethno-cultural examination of the rise and fall in rice diversity in southern India with special reference to the Western Ghats	Dr.M K Sebastian Dr. P.R.Arun Dr.P.A.Azeez	-	Ms. Chaithra Shree	2.5 years	14,75,000/-	Indira Gandhi National centre for Arts, Ministry of Culture, Gol	Jul - 2012	Dec - 2014	Completed.
26	ENVIS -Wetlands Ecosystems including inland wetlands	Dr Goldin Quadros	-	Dr. Hemambika B Ms. A. Jullia Begum A. Srinivasan .	-	12,00,000/-	MoEF&CC, Govt of India	-	-	Ongoing

27	Assessment of the morphological diversity and the ecological patterns in the near threatened colonial water birds across Indian sub-continent using novel approach	Dr. M. Mylswamy	-	Rajneesh Dwevedi	3 years	16,45,000/-	Dept. of Science and Technology, Govt. of India	May-12	May-15	Ongoing
28	Nature Education Activities for Coimbatore at SACON	Dr. P. Pramod	-	-	long term		SACON & local sponsors for various programmes	-	-	Ongoing
29	Monitoring Nature Through Birds	Dr. P. Pramod	-	Ms. C. Divya Priya	3 years	-	Dept. of Science and Technology	Mar-13	Mar-16	Ongoing



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