

annual report

2009-10



भारतीय वन्यजीव संस्थान
Wildlife Institute of India

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The year 2009-10 has been important for us in many ways. The apex Governance arm of the Institute i.e. WII-Society was reconstituted with Hon'ble Shri Jairam Ramesh, Minister (I/c) Environment & Forests as President of the Society. The Governing Body, executive arm of management, was also reconstituted with induction of new set of non-official members. The reconstitution of the governance apparatus provided us with opportunity to appraise the functioning of the Institute and to reposition it for meeting emerging challenges in managing wildlife resources of the country. As a sequel to this exercise, Institute took up new initiatives which included, organizing workshop for media personnel, Trainers Training Programme for Tiger Range Countries in association with Smithsonian Institution, Washington D.C., Consultation Workshop for State Forest Secretaries and Chief Wildlife Wardens and Training Programme on Wildlife Conservation for Senior Army Officers.

The year under report has also been important in terms of visit of eminent personalities which included Dr. Ashok Khosla, President International Union of Conservation of Nature & Natural Resources and Dr. Montek Singh Ahluwalia, Deputy Chairman, Planning Commission. The re-engineered website of Institute was also launched on 10th August, 2009 by Dr. Ahluwalia.

The Annual Report for the period 2009-10 captures the activities of the Institute in the areas of wildlife education, training, research and outreach: the four facets of our mandate. It reflects our constant endeavour for excellence.

I thank all our faculty and staff for their good work during the year.



(P.R. Sinha)
Director



role & mandate

Introduction

Our Mission

Aims & Objectives

Introduction

The Wildlife Institute of India (WII) is an autonomous organization of the Ministry of Environment & Forests. It is a premier training and research institution in the field of wildlife and protected area management in South Asia. Since its inception, WII has had the benefit of collaboration with international organizations such as UNDP, FAO, USFWS, IUCN and UNESCO. These collaborations have helped WII build a competent faculty and staff through rigorous training and exposure to modern research and analytical techniques.

WII's wide array of capacity building programmes provide a more practical and realistic direction to the concept and practice of wildlife conservation by seeking the involvement and cooperation of local communities. By learning from its own and others' experiences, WII is traversing a path of hope and aspiration, which will help strengthen its inputs and efforts to find answers to better address wildlife conservation issues and challenges in the country as well as in the South Asian region.

Our Mission

Our mission is to “nurture the development of wildlife science and promote its application in the field in a manner that accords with our economic and socio-cultural milieu”.

Aims and Objectives

- To build up scientific knowledge on wildlife resources
- To train personnel at various levels for conservation and management of wildlife
- To carry out research relevant to management, including the development of techniques appropriate to Indian conditions
- To provide information and advice on specific wildlife management problems
- To collaborate with international organizations on wildlife research, management and training
- To develop as a regional centre of international importance on wildlife and natural resource conservation



B.S. Adhikari

research reports

Ecology of the Brown Bear (*Ursus arctos*) with Special Reference to Assessment of Man-Brown Bear Conflicts in Kugti Wildlife Sanctuary, Himachal Pradesh, India



Funding source:

Grant-in-Aid

Investigator:

Dr. N.P.S. Chauhan

Researcher:

Rajkishore Mohanta

Date of initiation:

March 2006

Date of completion:

March 2010

Objectives: The project objectives were to: (i) prepare land cover, landuse and habitat maps, quantify the vegetation composition and structure in Kugti Wildlife Sanctuary and determine areas suitable for the brown bear using geographical information systems; (ii) study the distribution and relative abundance of the brown bear in relation to habitat characteristics; (iii) study the nature and extent of the man-brown bear conflict—human casualties, livestock killing and the nature and extent of the agricultural crop damage; (iv) assess the impacts of biotic pressures on the brown bear habitat; (v) study the food habits and seasonal changes in the dietary intake of the brown bear; (vi) study the socio-economic impacts of the brown bear menace on the rural community; and (vii) formulate recommendations for mitigation of the man-brown bear conflict and suggest conservation and management plans for bears in affected areas of Chamba district.

Progress: In Kugti Wildlife Sanctuary, the Himalayan brown bear (*Ursus arctos*) was found to occur in low densities in rolling uplands, alpine meadows, scrub and sub-alpine forests. The use of the habitat by the brown bear was related to the availability of food resources, food plant diversity and availability of shelter in different habitat types.



Brown Bear: Rajkishore Mohanta

There were 25 species of food plants in agricultural land, 13 species in grassland and forest blanks, nine species in mixed forest with conifers and broad leaf species, nine species in moist temperate forest with conifers, 11 species near water bodies, rivers and streams, 10 species in dry alpine scrub characterized by *Juniperus* species, six species in riverine forest, eight species on exposed rock with slope grasses and nine species in moist sub-alpine scrub with *Rhododendron* species. Bears preferred gentle to steep slopes. Out of 12 habitat categories, the brown bear used 11 habitats. The density of digging signs per hectare was highest in moist sub-alpine scrub dominated by *Rhododendron* species (101.91 diggings/ha). Whereas, the number of scats per hectare was highest in agricultural land (53.07 scats/ha). To study the socio-economic impacts of the brown bear menace, 34 families out of the 40 families in upper Kugti village were interviewed. In lower Kugti village, there were about 90 families, and a few randomly selected families were interviewed.

Outputs and outcomes: A total of 176 scats were analysed and the food remains/other hard parts in the scats were identified through reference material and hair characteristics. The brown bear diet had higher proportions of plant matter (79%) than animal matter (21%). During the summer, monsoon and fall, the frequency of occurrence of plant matter was 72.2%, 77% and 91%, respectively, and the frequency of occurrence of animal matter was 27.8%, 23% and 9%, respectively. Sheep, goat and goral remains were found in the animal matter. Insects were also found in the scats. The movement and habitat use pattern of brown bears were strongly influenced by the livestock movement pattern inside the sanctuary. Biotic pressure in the form of fuelwood and fodder collection and grazing was recorded along transects. Information on cut trees, lopping, livestock grazing, fire and human activity was collected and is being analysed. The bear distribution and habitat use patterns were greatly impacted by increasing biotic pressure.

Research and Conservation of Endangered and Threatened Fauna of Kachchh: An Integrated Approach



Funding source:

Grant-in Aid

Investigators:

Dr. Y.V. Jhala (WII) Dr. A. Rahmani (BNHS)
and late Dr. Ravi Sankaran (SACON)

Researchers:

I. P. Bopanna, Kamlesh Maurya and Sutirtha
Dutta

Date of initiation :

December 2004

Date of completion:

March 2011

Objectives: The objectives of the project are to: (i) study the ecology and seasonal movement patterns of the great Indian bustard so as to develop an effective conservation strategy for the species in Kachchh; (ii) monitor wolf, hyena and caracal populations and evaluate the role of different mortality factors and dispersal in their population dynamics; (iii) study the ecology of the Indian fox; (iv) monitor the visiting populations of the lesser florican and houbara bustard and if feasible study the migratory patterns of the lesser florican; (v) monitor the roosts and breeding status of vultures; (vi) sensitize local communities to the conservation needs of their endangered and threatened fauna; and (vii) evaluate the ecological and economic sustainability of traditional pastoral practices, and evaluate the impact of livestock depredation by the wolf on the economies of these communities.

Progress: Fieldwork during the reporting period has achieved progress in: (i) estimating the population status and habitat relationships of the great Indian bustard and lesser florican; (ii) investigating the social interactions of the striped hyena; (iii) estimating the demographic parameters of the Indian fox; (iv) monitoring the nesting status of the Oriental white-backed vulture; and (v) assessing the adverse impacts of agricultural encroachment in grasslands on the spiny-tailed lizard population, followed up by sensitization of local villagers to grassland conservation needs.

Outputs and outcomes: Monitoring designs were developed for two endangered (IUCN) bustards: the lesser florican (global population ~2200) and the great Indian bustard *Ardeotis nigriceps* (global population ~300). The lesser florican population status was estimated in ~130 km² of prime bustard habitat (23.21°N- 23.23°N, 68.78°E-69.05°E) using line transect based distance sampling. The florican

density was 1.01 (15%_{CV}) km⁻² in 2009 and varied annually with precipitation. Sites of 1 km² extent with more grassland than cropland cover, located away from villages, roads and farm households were preferred by the species. The great Indian bustard population status was estimated over ~1500 km² of agro-pastoral landscape in Abdasa and Mandvi tehsils, the current species range in Gujarat. The landscape level bird density was estimated using vehicle-transect based distance sampling at 0.04_{mean} ± 0.01_{SE} km⁻². Only ~400 km² of this landscape still had a suitable habitat for the species. A relatively higher density of 0.20 (22%_{CV}) birds km⁻² was observed in the ~130 km² extent of prime bustard habitat. Sites with less cropland or scrubland cover, vegetation height <50 cm, higher food availability and a remote location away from roads were preferred by the species. Grassland mosaics with short (<25 cm), grazed, sparse grass cover, for displaying males, and tall (25-75 cm), undisturbed, dense grass cover, for nesting females, were found to be crucial breeding sites.

Ranging patterns, habitat requirements and social interactions of the elusive striped hyena were investigated by radio-telemetry of six individuals from three social units. It was found that all members of a clan participated in cub rearing, providing food, den guarding and play activities with cubs. Such "cub-centric social units" lasted for ~11 months, until the cubs started moving far from the dens. Each of the elder members used a different rendezvous refuge site (thickets, bushes, drains and rills) during the day but would gather together from different directions at the den in the evening, spend time with the cubs and leave for solitary foraging bouts at night and return to the dens, socialize and then take refuge in their respective rendezvous sites in the morning. Occasionally cubs would follow sub-adults to rendezvous sites. Intensity of den use by these

elder members decreased as cubs grew older. Male sub-adults dispersed when the cubs reached 6-7 months of age, and female sub-adults dispersed when the cubs were 12-13 months of age. These cubs then assumed the role of sub-adults to attend to the new litters of the breeding female and continued the “cub-centric socialization” pattern. One of the clans used 6-8 different dens each breeding season to raise cubs over three successive years.

The breeding pair density of the little known Indian fox was estimated by mapping active dens through intensive searches in ~400 km² of a grass-scrub-crop mosaic (23° 17' 44"N, 68° 57' 18"E). Vital parameters of 12 foxes were quantified by radio-telemetry. The breeding pair density during 2006-2009 was $0.25_{\text{mean}} \pm 0.02_{\text{SE}} \text{ km}^{-2}$. Pups were born in January, and both sexes participated in pup rearing for 4-5 months. Pups used the natal territory and shifted almost $8_{\text{mean}} \pm 2_{\text{SE}}$ dens within a 500 m radius of each other, prior to dispersal. The average litter size was $2.97_{\text{mean}} \pm 0.19_{\text{SE}}$ but differed between years ($F=12.04$, $p<0.001$), with the lowest in 2005 ($1.75_{\text{mean}} \pm 0.25_{\text{SE}}$) and the highest in 2008 ($4.17_{\text{mean}} \pm 0.21_{\text{SE}}$). Pup survival and recruitment also differed between years. The variation in these demographic parameters could be explained by annual fluctuations in precipitation and the corresponding resource availability.

Vulture nest counts from equivalent efforts at known breeding areas in Kachchh over successive years showed a continuing decline from 134 nests in 2006 to 39 in 2009 and 2010. The estimated nesting success was ~70%. Disguised interviews of local drug dealers, carcass dump-yard (*panjrapar*) managers and pastoralists suggested that there was widespread circulation of old diclofenac stocks even after the ban.

Accelerated land use changes owing to massive agricultural encroachment have depleted ~40% of the grasslands in the study area within the last three years. The effect on the spiny-tailed lizard, a Schedule II burrowing species, was assessed by monitoring its post-breeding (June-July) population status in successive years. Active-burrow counts in belt transects declined from $83.9_{\text{mean}} \pm 15.1_{\text{SE}} \text{ ha}^{-1}$ in 2008 to $31.3_{\text{mean}} \pm 8.5_{\text{SE}} \text{ ha}^{-1}$ in 2010, primarily due to habitat loss. A similar fate was observed in many other obligate grassland fauna. Since currently the most critical conservation need for the Kachchh landscape is to arrest such habitat disruptions, we are interviewing and interacting with local stakeholders to sensitize them on the conservation significance of grassland resources.



Spiny-tailed Lizard: I.P. Bopanna

Developing Management Capabilities for Wild Pig Damage Control in Agro-ecosystems in and Around Protected Areas of India



Funding source:

Grant-in-Aid

Investigator:

Dr. N.P.S. Chauhan

Researchers:

Kuldeep Singh Barwal and Himanshu Shekhar

Date of initiation:

December 2004

Date of completion:

June 2010

Objectives: The objectives of the project are to (i) prepare habitat maps of Ranthambore National Park (RNP) and peripheral areas in relation to wild boar occurrence and quantify the vegetation composition and structure within each habitat; (ii) study the spatial and temporal distribution of wild pigs; (iii) study the population status and socio-biology of pigs; (iv) develop capture techniques; (v) quantify habitat use and ranging patterns and study the diurnal activity on a seasonal basis; (vi) study the feeding habits and reproductive biology; (vii) study health parameters of pigs; (viii) assess the man-wild pigs conflict; (ix) evaluate the use and efficacy of power fences in controlling crop damage; and (x) suggest cost-effective methods to control wild pigs and mitigate agricultural crop damage.

Progress: The study of the status and distribution, group size and composition, and habitat use by wild pigs in RNP has been completed. Information on the habitat types and activity of wild pigs was collected. A total of 1135 hours of observations were made over 293 days. Based on direct and indirect sightings, information on the spatial and temporal distribution of wild pigs has been collected.

Wild pigs were sighted 259 times, involving 1269 individuals. The group size of 1-4 individuals was sighted most frequently ($n=170$), followed by group sizes of 5-8 ($n=45$), 9-12 ($n=30$), 13-16 ($n=9$) and 17-20 ($n=2$) individuals. Lone pigs represented 24.7% of the sightings, and they were mainly of males. A group size of 49-52 individuals was seen only twice. The mean group size of the wild pigs varied from 2 to 8 individuals in different months. During the monsoon, the mean group size was highest (6 ± 1.79), followed by winter (5.75 ± 0.64) and summer (3.98 ± 0.28). The median group size was 3 in the monsoon ($n=48$), 3 in summer ($n=115$) and 4 in winter ($n=96$). There was marked monthly variation in the male:female piglet ratio. During the monsoon the mean male:female ratio of the wild pigs was

1:1.37, whereas it was 1:0.77 and 1:0.6 during summer and winter, respectively. Although the adult to sub-adult ratio varied considerably in different months, the percentage of adults was more than that of sub-adults. Piglets were classified into three age-classes: adults (>2 years old), sub-adults and piglets with stripes. Social groups of wild pigs were classified into seven types having 1-4, 5-8, 9-12, 13-16, 17-20, 25-28 and 49-52 individuals. Wild pigs were found to use eight habitat categories. The use of waterbodies and banks by pigs was 77.1% and 74.2% during winter and summer, respectively. During the monsoon, pigs used the *Anogeissus pendula* forest more (55.5%); in summer and winter they used the riparian forest (16.7%). They avoided steep hills and slopes.

For capturing wild pigs, two panel traps were fabricated. The captured and radio-collared male had a home range of 18.5 km^2 . The average home range of sows was 9.14 km^2 . To study the feeding habits and seasonal changes in the dietary intake of wild pigs, direct observations were made, and faecal samples were analysed. From 255 samples, plant material was found to constitute the major part, compared with animal matter. Wild pigs form matriarchal groups known as "sounders". In Ranthambore, breeding groups comprised 5-20 sows and one mature male. Observations revealed that the average litter size was 3-4 piglets for the first litter, increasing to up to 10 in older sows.

The socio-economic study was conducted in 52 villages. Information on the agricultural crop damage pattern was collected on a seasonal basis. Out of 90 villages situated in the periphery of the park, 21 villages were found to have a severe crop damage problem. The spatial distribution of the damage causing species and crop damage pattern are correlated. The data are being processed for further analysis and interpretation.

Conservation Ecology of Sangai *Cervus eldi eldi* and Its Wetland Habitat in Keibul Lamjao National Park



Funding source:

Grant-in-Aid

Investigators:

Dr. S.A. Hussain and Dr. Ruchi Badola

Researchers:

Sangeeta Angom, Ngailian Vaiphei,
Sanggai Leima Thounaojam and Chongpi
Tuboi

Date of initiation:

December 2004

Date of completion:

March 2011

Objectives: The objectives are to: (i) monitor the extent and quality of habitat (*phumdis*) within Keibul Lamjao National Park (KLNP); (ii) estimate the seasonal availability of browsing biomass for the sangai and associated grazers; (iii) monitor the population of the sangai in KLNP so as to derive the population parameters such as density, demography and spacing; (iv) quantify the basic needs of the species in terms of food, space and cover for sustained reproduction; (v) determine the stocking rates of the sangai and associated grazers in the park; (vi) examine the variation in the mitochondrial DNA as well as nuclear DNA using a control region and microsatellite primers to gain a better understanding of the genetic population structure; and (vii) explore the possibility of establishing a second home for the sangai in the wild within Manipur State.

Based on preliminary observations and a request from the Manipur Forest Department, another objective dealing with quantification of the extent of dependency of local communities on KLNP and suggestion of measures to minimize conflicts arising due to such resource use was added.

Progress: During the reporting period, the livelihood options for the local people living around KLNP were evaluated so as to resolve the conflict between biodiversity conservation and the livelihood of the local people. Questionnaire based surveys and focused group meetings were conducted to examine the preferences among various livelihood options and the potential for mitigating pressures on the park *vis-à-vis* improving the economic condition of the people. Since the majority of the people opined that ecotourism is a potential source of livelihood, a travel-cost method was used to evaluate the recreational potential of the park and a contingent valuation method was used to determine the willingness to accept compensation for not using the park resources. The perception and aptitudes of the people were analysed to design and test interventions to improve park-people relationships.

Outputs and outcomes: The study revealed that 97% of the people wanted to contribute to the conservation of the sangai. Around 70% of the people proposed that permits should be issued for controlled resource extraction to continue their existing livelihood, while 23% of the people wanted to be allowed to continue resource extraction without taking any compensation and 9% were ready to forego the option in support of conservation. Analysis of the willingness to accept compensation revealed that the compensation amount for foregoing resource extraction from the park ranged from Rs.25,133 to Rs.56,250 per household. Though the travel-cost method revealed that the recreation value of KLNP was Rs.20,71,973 per annum, the feasibility analysis found little potential for this venture because of the socio-political conditions of the state. The other livelihood options for the people were fishery, handloom and employment in forestry related activities, which need to be promoted with an aim to reduce the biotic pressure on the park.



Sangai: S.A. Hussain

Ecology of Tigers (*Panthera tigris* L.) in Pench Tiger Reserve, Madhya Pradesh and Maharashtra



Funding source:

Investigators:

Researchers:

Date of initiation:

Date of completion:

Grant-in-Aid

Dr. K. Sankar, Dr. Y.V. Jhala, Shri Qamar Qureshi (WII) and Dr. Rajesh Gopal (National Tiger Conservation Authority, New Delhi)

Aniruddha Majumder and Santanu Basu

September 2005

March 2013

Objectives: The objectives of the project are to: (i) collect information on the ranging, movement and dispersal patterns of tigers; (ii) study the use of the habitat by tigers; (iii) gather information on the food habits of the tiger; (iv) assess the population of prey species; and (v) prepare a habitat suitability map for the tiger and its prey and make recommendations for the effective management of the tiger population in Pench Tiger Reserve and adjoining areas.

Progress: One adult male, one sub-adult male tiger and one adult tigress were radio-collared during the reporting period. A total of 570 tiger scats were collected and analysed. Forty-four line transects were surveyed (total effort=752.7 km), covering each beat of Pench National Park and Sanctuary, to estimate the prey availability. Line transect data were analysed using DISTANCE 5 software. The population and density of tigers in the years 2006, 2008 and 2009 in Pench were analysed.

Outputs and outcomes: The estimated mean annual home range (MCP method) of the male tiger was 30.5 km² (n=118 locations), that of the adult female was 23 km² (n=400 locations) and that of the sub-adult male was 15.2 km² (n=80 locations). The common langur was the most abundant prey species in the study area (74.2±6.9 SE km²), followed by the chital (61.8±9.2 SE km²), the wild pig (8.3±1.9 SE km²), the sambar (6.1±0.7 SE km²), the peafowl (3.9±0.8 SE km²), the nilgai (1.9±0.4 SE km²) and the gaur (0.9±0.3 SE km²). The estimated mean biomass for the seven potential prey species was (5363.9±838.7 kg km²), with the chital (2908.5±434.9 kg km²) contributing the maximum, followed by the sambar (816.5±91.6 kg km²), the langur (593.2±54.4 kg km²), the gaur (429.3±129.4 kg km²), the nilgai (336.78±65.5 kg/km²), the wild pig (265.8±60.1 kg/km²) and the peafowl (13.9±2.8 kg/km²). Scat analysis (n=570) revealed the presence of 11

prey species in the tiger diet, and the chital represented the major prey in terms of numbers (55.6%), followed by the sambar (27.7%), the common langur (7.4%), the wild pig (5.4%), cattle (1.1%), the nilgai (1.4%), the hare (0.5%), rodents (0.4%), the porcupine (0.2%) and unknown birds (0.2%). However, analysis of tiger kills revealed that the chital was the most utilized prey species, followed by the sambar, the nilgai, the wild pig and the gaur. The tiger population was estimated using mark-recapture techniques, and the M (O) null model was found to be the best fitting model. The estimated population of the tiger in Pench Tiger Reserve was 14±0.3 in 2006, 21±1.5 in 2008 and 18±1.6 in 2009. The density of tigers/100 km², was estimated using a spatially explicit model (IP-Dens): it was 5.2±2 in 2006, 4.5±1.5 in 2008 and 6±2.8 in 2009.



Santanu Basu



Funding source: Grant-in-Aid
Investigator: Dr. S. P. Goyal
Researchers: Sudhanshu Mishra and Imran Khan
Date of initiation: October 2005
Date of completion: March 2011

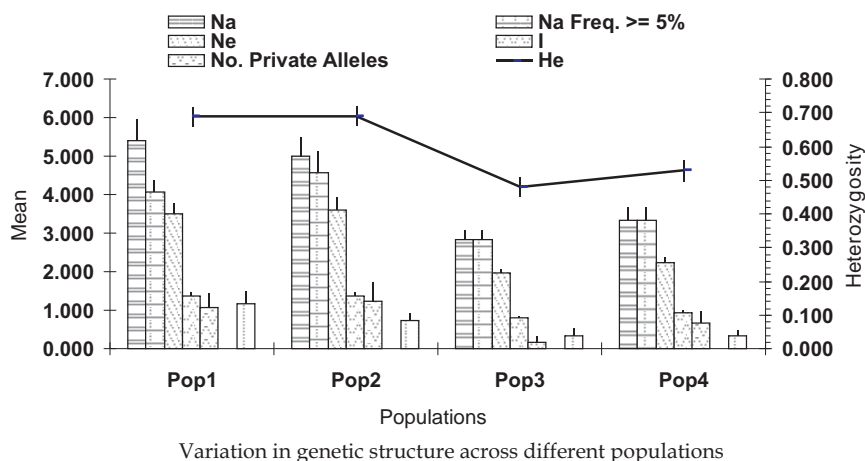
Objectives: The present study is aimed at developing a genotype profile of the tiger with the following objectives: (i) to develop and establish protocols for identification of the tiger from various seizures in the form of skin, nails, whiskers and bones based on DNA techniques; (ii) to establish non-invasive genotyping of different populations of tigers in India; (iii) to determine the source of origin of various tiger parts and products seized under wildlife offences; and (iv) to study the genetic diversity in different tiger populations of India.

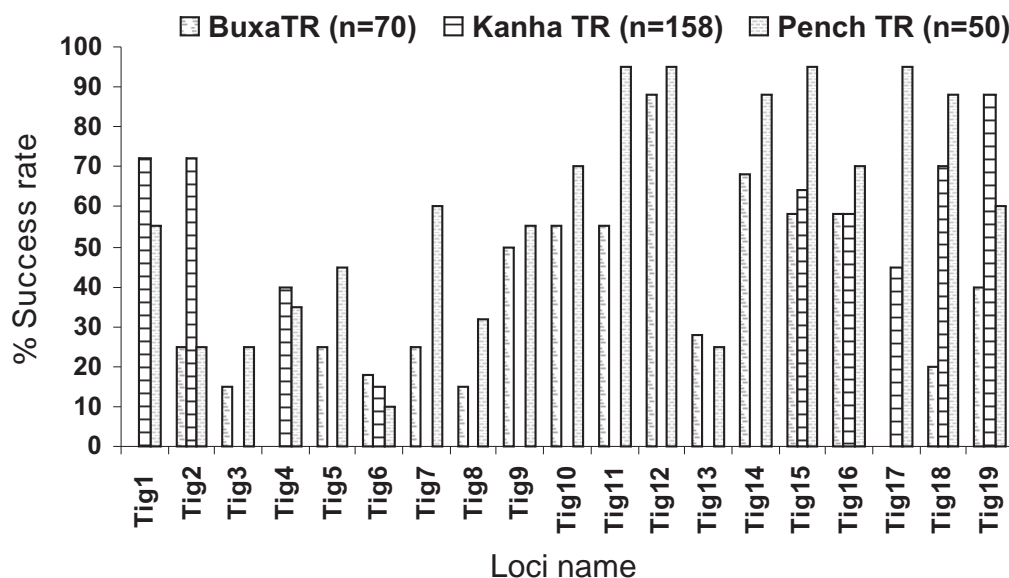
Progress: (i) Probable tiger scat samples (>433) were collected from different tiger populations, with GPS locations noted, and dried in an oven at 55°C. (ii) Genomic and mitochondrial DNA extraction was optimized with known samples of tissue (n=30) and blood (n=10) and scat samples using the Qiagen kit protocol. (iii) A felid specific microsatellite locus, Ple46, was amplified for species identification. Multiplex PCR were used for sex identification. A primer pair was used for the amplification of partial fragments of the SRY gene along with a primer for a microsatellite locus (Ple46) as an internal marker. (iv) All reference samples (n=40) were grouped into four different

populations to obtain reference data at the population level. Nineteen heterologous microsatellite loci were shortlisted and tested for their applicability in reference tiger DNA samples, which were developed for other tiger sub-species.

PCR products for 19 microsatellite loci were then subjected to fragment analysis using the ABI 3130 Genetic Analyzer. These loci were then analysed for allele patterns across populations and the probability of identity with all the reference DNA samples. Initially, all 19 microsatellite loci were screened with scat DNA samples (n=278) to check their applicability with non-invasive samples.

The genetic diversity was assigned for Buxa (n=70), Kanha (n=158), Pench (n=50), Palamau (n=35) and Panna tiger reserves (n=120) using selected polymorphic microsatellite loci. The amplified PCR products for 19 microsatellite loci were then subjected to fragment analysis using the ABI 3130 Genetic Analyzer with Hi Di formamide and LIZ, and analysed for allele size ranges, allele numbers, amplification success rate and the probability of identity with all the scat DNA samples. The PCR success rates of DNA extracted from scats collected from Buxa, Kanha and Pench tiger





Amplification success rate of 19 microsatellites with scat DNA from three tiger populations

reserves were examined. In Buxa Tiger Reserve, the probability of identity (PID) was estimated in GENEALX for unrelated individuals and siblings (PID-sibs).

Of the 19 polymorphic microsatellite loci, 12 were selected to generate four multiplex panels. All primers of the panel had the same PCR cycling conditions. Reference blood DNA samples that were used to confirm amplification of the multiplex panels were tested. All selected loci for the multiplex panels were different in either amplicon size range or fluorescently labelled dyes.

The loci which did not amplify with scat DNA samples in the multiplex panels were further amplified using direct uniplex PCR. These two multiplex panels are under analysis for further validation with scat DNA.

Outputs and outcomes: DNA was extracted with a 98% success rate from scat samples (n=433) from different tiger reserves using QIAamp DNA Stool Mini Kit (Qiagen, Germany). The PCR success rate was 70% to 90% with scat DNA within the 100-170 bp amplicon range. Therefore, it was decided to target an amplicon size range of <200 bp. Scat DNA was assigned for species identification using a species specific allelic pattern of Ple46. It was possible to assign the sex from confirmed tiger scat DNA samples using a

multiplex PCR with SRY and Ple46 primers. Genetic diversity was assigned by amplifying 19 microsatellite loci with tiger reference DNA samples from four different tiger populations of India. Twelve loci were found to be highly polymorphic, with the number of alleles ranging from three to nine in different populations. The mean number of alleles per locus ranged from 2.833 to 5, with the highest in population 2. The mean observed heterozygosity ranged from 0.32 to 0.67. Based on these results, two multiplex panels were designed with 12 highly polymorphic microsatellite loci. PCR conditions were successfully standardized and found applicable to blood as well as scat DNA. The genetic diversity in Buxa (n= 70), Kanha (n= 158) and Pench (n= 50) tiger reserves was assessed with a selected panel of microsatellite loci.

Milestones: DNA was extracted with a good success rate from tissue, blood and scat DNA samples from different tiger populations. These DNA samples were PCR amplified to assign the species and sex. The genetic diversity of the reference DNA samples was assessed with 12 microsatellite loci. Two multiplex PCR panels were designed with six microsatellite loci in each. Using non-invasive samples of Buxa, Kanha and Pench Tiger Reserves, an assessment of the genetic diversity was attempted using 19 microsatellite loci.

Preparation of the Status of Indian Coastal and Marine Environment and a Network of Marine Protected Areas



Funding source:

Grant-in-Aid

Investigators:

Shri B.C. Choudhury and Dr. K. Sivakumar

Researcher:

K.R. Saravanan

Date of initiation:

November 2005

Date of completion:

April 2010

Objectives: The objectives of the project are (i) to survey the coastal and marine areas of the country to answer the following questions— (a) What are the biological values or resources which require conservation along the Indian coast, (b) What is the present PA situation with respect to coverage of these resources, (c) What spatial gaps exist in creating a network of coastal and marine PAs, (d) How can these gaps be filled, and (ii) to prepare a comprehensive report on the state of India's existing coastal and marine PAs.

Progress and outcomes: The status of coastal and marine habitats of the Indian mainland, especially, Karnataka and Kerala in the west coast and Orissa, Tamil Nadu and Andhra Pradesh in the east coast, was determined during the reporting year. Coastal and marine biodiversity-rich habitats such as mangroves, estuaries, backwater, mudflats, sand dunes, sea turtle nesting beaches and lagoons within and outside the coastal and marine protected areas were taken into consideration for this study.

Following a prescribed methodology, a criterion was developed and applied to designate coastal biodiversity rich-sites as Important Coastal and Marine Biodiversity Areas (ICMBA). This study intends to designate such possible sites of all the coastal states as priority conservation areas under the ICMBA criterion so as to conserve in the future the hitherto unidentified coastal and marine habitats as potential biodiversity-rich habitats.

A preliminary review of the Indian Marine Protected Areas (MPA) reveals that most of the MPAs are not managed with a proper management plan, which is required to be prepared for all MPAs of India. In India, there are 27 coastal and marine protected areas. Of these, 18 are offshore, which are protecting or conserving exclusively marine life forms,

and these PAs are considered to be exclusive MPAs. Of the 18 MPAs, seven have the status of marine national parks, whereas the remaining are wildlife sanctuaries.

Milestones: Besides the existing 18 exclusive MPAs, a few offshore sites along the east and west coasts of the Indian mainland and one in the Lakshadweep Islands have been recognized as Important Coastal and Marine Biodiversity Areas, and it has been recommended that these be declared as MPAs. Several Important Coastal and Marine Biodiversity Areas (ICMBAs) have also been identified all along the coastal regions of India, which have biodiversity value and potential to be considered as community reserves or biodiversity heritage sites. A draft report of the ICMBAs of all the maritime states except the islands has been prepared.

Ecology of Two Endemic Turtles in the Western Ghats, India



Funding source:

Grant-in-Aid

Investigators:

Dr. Karthikeyan Vasudevan and Dr. Bivash Pandav

Researcher:

V. Deepak

Date of initiation:

January 2006

Date of completion:

October 2010

Objectives: The objectives of the project were to: (i) estimate the population density of the Travancore tortoise and the cane turtle in a fragmented landscape; (ii) quantify the diet of these two species and describe the feeding ecology with respect to their role in seed dispersal; (iii) identify threats to the turtle population based on their habitat use, ranging pattern and food habits and recommend measures for their conservation; and (iv) carry out a survey of these two species along the Western Ghats to ascertain the exact distribution in the context of the protected area network in the region.

Progress: A stratified random sampling approach was followed to sample the Travancore tortoise. Ten trails were marked in four different habitat types in the study area. Surveys were carried out in a mark-recapture framework wherein all trails were sampled repeatedly in a given season. Three repeats of 30 transects were sampled during the monsoon of 2009. Direct observations were made on tortoise feeding, and faecal samples were collected to find out the diet of the species. Morphometric details of all captured tortoises were recorded/measured to find out the degree of sexual dimorphism and monitor the growth rate of individuals.

Five Travancore tortoises were fitted with radio-transmitters and tracked on a daily basis. Temperature loggers were also fitted on the carapace to record the carapace surface temperature. The faeces of individual turtles were collected and dried under a 40 W bulb. The dried material was then separated and examined using a 10× hand-held lens. The study area was mapped manually using a hand held compass, clinometer and measuring tape. A 42 ha area was thus delineated for the cane turtle study, and a 110 ha area was delineated for the Travancore tortoise study. Individual tracking locations were plotted every day on the study area map. Home range was calculated using two

different estimation methods: the 100% minimum convex polygon (MCP) and adaptive 90% local convex hull (LCH) isopleths. The MCP and LCH were calculated using the adehabitat package in the R software.

Vayals or grass marshes surrounded by woodland were mapped using a GPS. From the centre of the marshes, random compass bearings and distances were chosen and 1×1 m² plots were laid. The 1×1 m² plots have a total of 100 equal sized grids of dimensions 10×10 cm². The percentage of flowering/non-flowering plants, dry/green cover and grazing were recorded within the 1×1 m² plot. The frequency of occurrence of each grass and herb species was enumerated within each 1×1 m². The distances from the forest edge and water bodies of each plot were measured. The invasive species of plants, animal use and surface characteristics of the *vayal* were also studied.

Outputs and outcomes: Twenty-two Travancore tortoises were captured and marked from January 2009 to January 2010. The detection probability obtained from the visual encounter surveys was low, and therefore, site occupancy rates could not be calculated. The encounter rate of the Travancore tortoise was 0.14 individuals/man hour for a sampling effort of 152 man hours. The encounter rate of the tortoise was highest in evergreen forests (0.35/man hour) followed by bamboo (0.09/man hour), teak (0.06/man hour) and moist deciduous forest (0.05/man hour).

Travancore tortoises were found to feed on grass, fungi, bamboo shoots, fallen fruits, flowers, insects and frogs. Faeces collected from 24 tortoises contained at least one identifiable diet item. Ninety-two percent had grass/bamboo blades, 92% had other plant matter (leaves and stems), 83% had insect remains, 63% had sand, 42% had seeds (*Grewia tilaefolia* and *Dillenia pentagyna*), 38% had

vertebrate remains (identified as skink scales, mammal hair and vertebral bones) and 13% had mollusc, scorpion and crab remains. They also scavenged on carcasses of mammals such as sambar (*Cervus unicolor*).

The home range size of the Travancore tortoise varied from 5.2 ha to 34.7 ha (using the MCP method) and from 0.1 ha to 4.2 ha (using the LCH). Radio-tracked turtles had less overlap (0 to 8.5 %) in their MCP home ranges. Four tortoises attached with radio-transmitters (two males and two females) spent about 43% of the time inactive under leaf litter, 27% in pangolin and termite hill burrows, 13% in *Lantana camara*-associated scrub, 6% in the bamboo clump, 4% under grass, inside tree holes and under fallen logs/liana, 3% inside rock cavities and 2% in the open. Three radio-tracked individuals showed a pause in activity during the drier months, November to March. One individual (male #2) was inside a rock burrow.

A total of 11 *vayals* (three in Parambikulam Tiger Reserve and eight in Anamalai Tiger Reserve) were mapped, and 180 plots were laid in these *vayals*. Sixteen species of grass and 64

species of herb were collected; three out of the 64 species of herb were invasive. Three invasive species of plant were recorded in the *vayals* opportunistically. All the species recorded in the survey were collected, and herbarium sheets were prepared for accurate taxonomic identification.

Milestone: Preliminary data analysis suggests that cane turtles are thermoconformers (preferred temperature closely matching environmental temperature). They responded to daily fluctuations in temperature. They were more active on days with lower temperature fluctuations compared with higher fluctuations ($>5^{\circ}\text{C}$). Rainfall influenced movement in cane turtles, and they were found feeding and mating during rains. They moved within a 5-8 ha area. Crucial habitats such as the swamps in the woodland openings (locally known as *vayals*) require area-specific protection and management. *Vayals* provide an important foraging area for Travancore tortoises during the dry season and probably serve as refuges during forest ground fires.



Travancore Tortoise: V. Deepak

Conservation of Red Jungle Fowl (*Gallus gallus*) in India



Funding source:

Investigators:

Researchers:

Date of initiation:

Date of completion:

Grant-in-Aid

Dr. S. Sathyakumar (WII), Dr. Rahul Kaul (Wildlife Trust of India) and Dr. Rajiv S. Kalsi (MLN College, Yamuna Nagar)

Merwyn Fernandes and Mukesh

September 2006

February 2011

Objectives: The objectives are to: (i) assess the status and distribution of the Red Jungle Fowl (RJF) in India; (ii) identify pure RJF populations by molecular genetic studies; (iii) investigate social interactions between the wild RJF and the domestic fowl; and (iv) propose a conservation action plan for the identified RJF populations.

Progress: Spatial patterns in occupancy were assessed in the western Shivalik landscape at different scales. Classification of landscape attributes such as vegetation cover and topography from high resolution Landsat images along with ancillary data on drainage and human habitations have been initiated. Field investigations included: (a) trail/transect sampling for RJF abundance estimation and (b) quantification of the availability and use of habitat and food resources by the RJF.

RJF and domestic fowl samples were collected from different sites in the north-eastern States, West Bengal and Jharkhand. Samples were also collected from the RJF captive populations in different facilities. High molecular weight genomic DNA was extracted from the collected samples and the protocols for DNA isolation (blood/feathers/tissue) and PCR cycling conditions were further refined. The DNA extracts were genotyped through PCR with 30 highly polymorphic microsatellite markers. The PCRs were carried out in a 10 µl reaction volume in an applied biosystem thermal cycler (2700 and 2720). The PCR products were pooled and denatured at 95°C for 5 minutes, and microsatellite genotyping was carried out using a 3130 automated DNA sequencer (Applied Biosystem) with Gene Scan 500 (-250) LIZ as the internal lane size standard. Data were collected and analysed using Gene Mapper Software (Version 3.7, Applied Biosystem). The observed and expected heterozygosity estimates were computed after Nei, as executed in POPGENE software. The observed number of alleles and estimated number of alleles were also evaluated using POPGENE software. The allelic frequencies were utilized for assessing polymorphic information content, a measure of the informativeness of a marker. The departure from the Hardy-Weinberg equilibrium was

derived using the exact test of POPGENE. Genetic identities and genetic distances among populations were also computed using GenAlex software. Further analysis is under progress.

Outputs and outcomes: Twelve loci were successfully genotyped with all DNA extracts, while genotyping of the remaining 18 loci is under way. All 12 microsatellite loci were polymorphic across populations. The north-eastern population showed the highest polymorphism and extensive genetic diversity, with $H_o=0.5747$, while the central Indian RJF population showed the lowest polymorphism, with $H_o=0.1818$. The number of alleles among five RJF populations and one domestic fowl population across all 12 loci ranged from 10.166 and 1.454, and the number of effective alleles ranged from 4.63 to 1.38. The overall summary statistics of 12 loci with six populations showed that loci LEI0234 yielded the highest number of alleles ($N_a=40$), while loci MCW0037 and MCW0222 yielded the lowest number of alleles ($N_a=6$). The number of observed private alleles among five RJF populations and one domestic fowl population for all the 12 microsatellite markers ranged from 0 to 32. The maximum number of private alleles ($n=32$) was found in the northern RJF population, followed by 11 private alleles in the domestic fowl population, while no private allele was found in the central Indian RJF population.

The Mean Genetic identities (MGI) and Mean Genetic Distances (MGD) in between domestic chicken population and all the five RJF populations ranged from 0.244 (Northeastern RJF population) to 0.406 (Central RJF population) and 0.783 (Northeastern RJF population) to 0.666 (Central RJF population), respectively.

Milestone: The final report of the activity of Phase I was submitted to WII and 21 RJF range states. In total, 310 RJF and 76 domestic fowl samples were collected, and from these, good quality g-DNA was isolated. PCR conditions were standardized, and 20 loci have been genotyped.

Habitat Ecology and Conservation Status of Wild Ungulates in Northern Parts of Changthang Wildlife Sanctuary, Ladakh



Funding source:

Grant-in-Aid

Investigators:

Dr. G.S. Rawat and Dr. K. Sankar

Researcher:

Ashwini Kumar Upadhyay

Date of initiation:

February 2007

Date of completion:

December 2010

Objectives: The objectives of the project are to: (i) study the habitat characteristics and use pattern by wild ungulates; (ii) assess the population and seasonal movement patterns of ungulates; (iii) assess the conservation status of various ungulates; and (iv) suggest conservation and management strategies and evolve a protocol for long-term monitoring.

Progress: A total of 21 trails (varying from 4 to 5 km long) were monitored for two seasons during the year 2009-2010. The habitat characteristics (vegetation community, terrain type, altitude, aspect, and snow/water availability) and habitat use by ungulates were quantified. Habitat parameters were recorded at 492 sites. The habitat use parameters were quantified based on direct sightings at the location of an animal sighting. The vegetation and habitat parameters were quantified using standard methods. The ungulate distribution and habitat use were also studied based on indirect evidence, i.e., dung/pellets, hoof marks, scats, hairs, etc. The transects were usually walked along valleys, hill slopes (contours) and ridgelines. Vantage points

were monitored to scan the slopes to record the activity pattern of ungulates. Once an animal was sighted, the time of sighting, location including its coordinates, number of animals in the group, sex and age composition, position on the slope, elevation, aspect and habitat attributes were recorded. Plant and pellet samples from different habitats and seasons were collected for nutrient analysis and micro-histological studies at the WII laboratory.

Outputs and outcomes: Over the three years, observations on the distribution of the Tibetan antelope (chiru) were made in the inner areas of Changchenmo, especially around the Hot-Spring area, Kukrung river, Silung Burma and Silung Yogma. A total of 45-50 individuals of chiru were estimated for the whole Changchenmo valley. In the year 2009-2010, there were only four sightings, with the biggest group having eight individuals. The chiru population in the Changchenmo valley preferred flat marsh meadows dominated by *Scirpus planifolius*, *Kobresia royleana*, *Kobresia pygmaea*, *Oxytropis humifusa* and *Potentilla anserina*.



Kiang: Amit Kotia

Evaluating Effectiveness of Interpretative Facilities in Enhancing Conservation Awareness in Select Tiger Reserves in India



Funding source:

Investigators:

Researcher:

Date of initiation:

Date of completion:

Grant-in-Aid

Smt. Bitapi C. Sinha and Dr. V.B. Mathur

Jyotirmay Jena

January 2007

March 2011

Objectives: The objectives of this study are to: (i) make an inventory of the interpretative facilities in the tiger reserves of the country; (ii) determine if the messages are delivered in an interpretative manner; (iii) find out if people are receiving the message and if they are feeling compelled to act differently as a result of it; and (iv) plan how to make it more effective if the interpretative tools are not effective.

Progress: A questionnaire survey was carried out in 28 tiger reserves, and responses were received from 18 tiger reserves. Based on the questionnaire survey, two sites, namely Kanha Tiger Reserve (Madhya Pradesh) and Tadoba-Andhari Tiger Reserve (Maharashtra), were selected for an intensive study. Questionnaire surveys were conducted amongst visitors of these two reserves to establish the socio-demographic profile of the visitors and to measure the effectiveness of the interpretative facilities used by the visitors. To understand the local peoples' attitude towards tourism and conservation and their role in the interpretative programme, a survey of the community was conducted around the two reserves.

Output and outcome: A total of 308 visitors were interviewed in Kanha Tiger Reserve and 267 visitors were interviewed in Tadoba-Andhari Tiger Reserve for determining the demographic profile of the visitors and the use of interpretative facilities. The satisfaction level of the visitors and the quality of the guides (knowledge and information) were also assessed. The opportunity to see a tiger and other wildlife were important factors for taking the decision to come to Kanha and Tadoba Andhari tiger reserves. The majority of the visitors were satisfied overall with the visit.

Pre- and post-visit questionnaires were administered to the visitors. There were 143 post-visit and 145 pre-visit

questionnaires in Kanha and 30 pre- and post-visit questionnaires in Tadoba Tiger Reserve. Since very few visitors use the interpretation centres in Tadoba, the sample size was not large enough for this reserve.

For data on visitors' behaviour and time spent on each exhibit, CCTV cameras were installed at the interpretation centres in Kanha and Tadoba. Data analysis is in progress.

Seven villages around Kanha Tiger Reserve and nine villages in and around Tadoba Tiger Reserve were surveyed to determine the local people's attitude towards tourism and their involvement in interpretation programmes. Over 90% of the villagers stated that tourism was beneficial, but only 33% of the people were directly or indirectly involved in tourism activity in the park.



Ecology of the Asiatic Black Bear (*Ursus thibetanus*) at Dachigam National Park, Kashmir



Funding source:

Grant-in-Aid

Investigator:

Dr. S. Sathyakumar

Researchers:

Lalit Kumar Sharma and Samina Amin
Charoo

Date of initiation:

March 2007

Date of completion:

February 2011

Objectives: The objectives are to: (i) assess the bear-human conflicts and threats to the black bear and its habitats at Dachigam and adjacent reserve forests and protected areas in the north-west Himalayan landscape; (ii) evaluate whether the distribution and relative abundance of the Asiatic black bear is influenced by the availability of the major food plants found in Dachigam National Park; and (iii) evaluate whether the activity, habitat utilization, movement and ranging patterns of the Asiatic black bear on a daily, seasonal and annual basis at Dachigam National Park are influenced by the availability and distribution of the major food plants of Dachigam National Park.

Progress: Fieldwork continued during the reporting year on assessing the Asiatic black bear distribution, relative abundance and habitat use based on direct and indirect evidence. Lower Dachigam (ca. 90 km²) was selected as the intensive study area and divided into 23 grids (2×2 km²). In each grid, one camera and hair snare station were placed. Thirteen transects/trails were used that covered all the grids in the study area to record bear sightings and signs. In total, 141 permanent vegetation plots were laid along these transects/trails and also in the riverine habitat along the Dachigam stream to quantify habitat variables. These transects covered an altitudinal range of 1600-2700 m and diverse aspect and slope categories. Data on the phenology of major food plants were recorded on a regular basis. Five bears (three females and two males) were fitted with Telonics VHF+GPS ARGOS uplink collars during the late summer and autumn of 2009 and were monitored regularly. Questionnaire surveys to assess the extent and magnitude of black bear-human conflicts were carried out in villages that were not sampled earlier.

Outputs and outcomes: In total, 809 bear sightings and signs were recorded, represented by 126 sightings, 372 scats, 131 feeding signs and 180 other signs (tracks, rake marks and rub signs). The abundance (number of bear signs/km±SE) of bears was highest (1.02±0.27) in summer followed by spring and autumn, and it was minimum (0.05±0.02) in winter. The relative abundance and use of different habitat types varied seasonally and was most prominently governed by the food availability. The availability of fruits of *M. alba* and herbs during May, fruits of *Prunus cerasifera* and *P. prostrata* during June and nuts of *Juglans regia* and acorns of *Quercus robur* during August and September determined the black bear relative abundance and habitat use patterns. Of all the black bear sightings and other evidence (n=809), about 31.6% were in riverine habitat, 23.1% in oak plantations, 15.1% in lower temperate pine mixed forest, 13.8% in lower temperate forest, 12.7% in mid-temperate forest and the remaining in grassland and scrubland habitats. During summer, 63% of bear sightings and signs were recorded in riverine habitats.

A total of 116 direct feeding observations of the black bear were made, of which the frequency of feeding observations was high for five plant species: *Q. robur* (21.4%), *M. alba* (16.6%), *P. armeniaca* (9.5%), *P. prostrata* (7.1%) and *P. cerasifera* (5.5%). In total, 372 scats were collected, and based on a micro-histological analysis, a significant seasonal variation in bear diet was found. Thirty-one food plant species were observed in the diet of the black bear. Food items that formed a significant proportion of the black bear diet were *Q. robur*, *P. sp.* and *M. sp.*, which have a high calorific value. Cultivated crops such as maize, apple, cherry and pear also contributed to the black bear diet as bears raided crops in the villages located in the fringes of the study area.

Based on the telemetry data of autumn and winter, information on movement and ranging patterns and hibernation periods has been obtained. Information on the den sites of collared and a few other untagged bears has been collected. The hibernation period of collared bears ranged from 45 to 90 days. One more bear is proposed to be collared to continue the investigations on black bear distribution, population and movement patterns using camera traps, satellite telemetry and the use of non-invasive DNA analysis.

Milestone: For the first time in India, five Asiatic black bears have been successfully live-captured, immobilized and radio-collared. A technical report titled “Asiatic Black Bear-Human Conflicts around Dachigam National Park, Kashmir” based on surveys carried out during the years 2007 and 2008 was published during Annual Research Seminar 2009. This report has been submitted to the Department of Wildlife Protection, J&K State, for use in their adaptive management and has also been hosted on the WII website.



Asiatic Black Bear: Lalit Kumar Sharma

Ecology, Behaviour and Interaction of Highly Dense Population of Sloth Bear (*Melursus ursinus*) and Human-Sloth Bear Conflict in Jessore Wildlife Sanctuary, Gujarat and Mount Abu Wildlife Sanctuary, Rajasthan (Phase II)



Funding source:

Grant-in-Aid

Investigators:

Dr. N.P.S. Chauhan (WII) and Prof. V.C. Soni (Saurashtra University)

Researchers:

Prakash Chandra Mardaraj and Bharat Sharma

Date of initiation:

October 2008

Date of completion:

April 2011

Objectives: The objectives of the project are to: (i) assess the distribution and population abundance of sloth bears in relation to habitat characteristics (terrain and vegetation) in the two sanctuaries; (ii) study social organisation (group size, structure, age, sex ratio and intra-specific behaviour); (iii) quantify the habitat use pattern and assess the impacts of biotic pressures on the bear habitat and develop a habitat suitability model; (iv) assess the habitat connectivity between the two sanctuaries and the biological characteristics of the corridor (vegetation cover, vegetation composition and biotic pressure) and functional status (use and intensity) with reference to the sloth bear population; (v) assess ranging and activity patterns and movement of sloth bears between the two sanctuaries using telemetry; (vi) study the food habits and seasonal changes in the dietary intake of the sloth bear; and (vii) formulate recommendations for habitat restoration and suggest conservation and management plans for sloth bears in the two sanctuaries.

Progress: Systematic surveys were carried out in Mount Abu and Jessore wildlife sanctuaries and in the corridor area between these sanctuaries. Data in the form of indirect evidence showed varying use of these available habitats by the sloth bear. For quantification of vegetation types, 32 linear transects were laid in different habitats including crop fields, mountain slopes, grassland and forest areas at different distances from habitation in Mount Abu Wildlife Sanctuary. Each transect was sampled three times a year. Sampling for trees was done within circular plots of radius 10 m every 250 m (n=128) along a transect of 1 km. GPS locations were taken for all the plots for support in classification of different vegetation types and accuracy

assessment. From the same sampling points, data were also collected for shrubs and herbs within circular plots of radius 5 m and 1 m, respectively.

To estimate the bear population abundance, the data collected by walking on linear transects are being compiled. All transects were walked four times over a period of one year in different seasons, and observations were recorded in pre-designed formats. The distribution pattern of the sloth bear was determined based on direct sightings and the number of den sites and from indirect evidence such as claw marks, footprints, diggings and the presence of scats. Outside the transects, indirect evidence of bears was recorded 368 times while carrying out intensive surveys. Most of this evidence was found in the dry deciduous forest (31.4%). So far 49 den sites have been identified in 23 places across the sanctuary. It was found that 25 dens were actively used by bears and 24 dens were used occasionally.

Information on group size, structure, age and intra-specific behaviour is being collected from Mount Abu Wildlife Sanctuary. A single bear, a group of two bears and a mother with cub(s) have been sighted in different areas. In total, 46 direct sightings (with total individuals of 78) of sloth bears in different locations were recorded, including adult, sub-adult and young ones. The vegetation/land use categories have been identified. The locations of the affected areas are being transferred on to toposheets. Suitable sites for capturing sloth bears and radio-collaring them have been identified to study the ranging and activity pattern. The baiting sites were selected close to the den sites and along foot trails. Baits were placed in the evening and checked early in the morning next day. A bear visit was confirmed by

the presence of bear footprints around the bait area. All necessary preparations are being done for capturing sloth bears and radio-collaring them. Faeces collected in polythene bags were sun dried and stored for further analysis. At the time of collection, the weight and diameter of these scats were measured using vernier calipers. Information about the collection sites (habitat type) was also noted.

Outputs and outcomes: Sloth bears occur in high densities in Mount Abu and Jessore wildlife sanctuaries. They have been found to use different habitats. Dry deciduous forests were used the most. They showed a positive response to bait, which is required for capturing and radio-collaring them.



Sloth Bear: Prakash Mardani

Status and Distribution of Malayan Sun bear (*Helarctos malayanus*) in North-eastern States, India



Funding source:

Grant-in-Aid

Investigator:

Dr. N.P.S. Chauhan

Researcher:

Janmejey Sathy

Date of initiation:

April 2007

Date of completion:

November 2011

Objectives: The project has the following objectives: (i) to assess the status and distribution of the Malayan sun bear in Arunachal Pradesh, Nagaland and Mizoram; (ii) to investigate habitat use by the sun bear in these three states; (iii) to assess the nature and extent of human-sun bear conflicts—human casualties and agricultural crop damage caused by the sun bear in these states; (iv) to identify “conflict zones” and conservation threats for the survival of the sun bear in these states; and (v) to suggest conservation and management strategies for the sun bear in these states.

Progress: Questionnaire surveys were carried out in 109 fringe villages located in and around protected areas of Mizoram, Nagaland and Arunachal Pradesh. In total, 538 respondents had direct sightings of sun bears. Those respondents who had direct sightings of the sun bear and those who reported crop raiding or indirect evidence were taken into account. There were more reports of direct sightings in the forest areas surrounding the villages. These were between the protected area and the villages, and, in some cases, inside the protected area and inside a village itself.

People reported indirect evidence such as claw marks (n=455), nests (n=93), scats (n=95) and footprints (n=175) in different protected areas of the direct sightings. The bears were found feeding (n=143), walking (n=175) and resting (n=200). The respondents saw these bears in the morning (n=197), evening (n=148), noon (n=186) and night (n=7) in different habitats. They were seen on roads/paths (n=17), in mixed forest (n=186), in semi-evergreen forest (n=206) and in tropical dry deciduous forest (n=129). Bears were found in the semi-evergreen forests mainly due to the availability of food resources and the low level of disturbance.

A stratified-random sampling method was used as the main template for data collection. Different types of bear signs (n=296) were observed, out of which the majority (71.99%) were on trees. Sign evidence indicated that trees were climbed by sun bears mostly for feeding on fruits (63.17%). Trees were also climbed for beehives (9.3%) and for unknown reasons (7.7%). Diggings were also observed at the base of trees for beehives as well as, in a few instances, for unknown reasons (possibly exploratory diggings for termites). At least 26 tree nests were recorded.

Bears were mostly sighted as single individuals (n=184), as females with cub(s) (n=1) and as a pair of individuals (n=34). On only a few occasions, two adult individuals were seen together. This was reported only from Mizoram.

Outputs and outcomes: On the basis of direct sightings and the indirect evidence of the respondents, sun bears have been found to occur in Mizoram, Nagaland and Arunachal Pradesh.



Claw Marks-Malayan Sun Bear: Janmejey Sathy

Comparison of Tiger (*Panthera tigris*) Population Estimated Using Non-invasive Techniques of Pugmark, Camera Trap and DNA Based Analysis of Hair and Scat in Ranthambhore Tiger Reserve. Phase II: Estimation of Tiger Population



Funding source:	Grant-in-Aid
Principal investigator:	Dr. S.P. Goyal
Co-investigators:	Dr. K. Sankar and Shri Q. Qureshi
Researcher:	Randeep Singh
Date of initiation:	April 2007
Date of completion:	March 2011

Objectives: This study was based on standardized protocols for tiger population estimation using non-invasive techniques developed during Phase-I (October 2005-March 2007). Phase-II of the project aims to: (i) determine the tiger population employing pugmark, camera trap (sight and re-sight) and non-invasive DNA based techniques using scats and remotely collected hair in an intensive study area of ca. 150-200 km² of Ranthambhore Tiger Reserve, Rajasthan and (ii) compare tiger estimates determined by various methods in various seasons with respect to precision and accuracy and suggest appropriate protocols, which are practical, suitable in various scales and cost-effective for estimating tiger numbers in dry tropical habitats.

Progress: Data were collected from March 2009 to March 2010 in different seasons, *i.e.*, summer (March 2009 to May 2009), post-monsoon (October 2009 to December 2009) and winter (December 2009 to March 2010). The study area was divided into 1×1 km² grids, and a total of 224 grids were selected based on the presence of tiger indirect evidence (pugmarks and scats). Grids were sampled in consecutive

three blocks by deploying 72 camera traps. Track plots were also established for collecting the pugmarks of identified individuals. Each trapping station was operated and monitored for 15-20 days. The hind left or right pugmark was traced using tiger tracers and was photographed. The pugmark cast was also prepared, using plaster of Paris.

Outputs and outcomes: Intensive monitoring of 224 camera trap stations in different seasons yielded 490 tiger photographs. A total of 3880 camera trap night efforts resulted in 234 photo-captures of tigers (119 right flanks, 95 left flanks, 14 frontal, 6 rear). Of these, 35 individual tigers ((18 females and 17 males) of >12 months of age and two cubs (<1 month)) were identified. The estimated tiger density using (i) $\frac{1}{2}$ MMDM was 10.84±1.2 tigers per 100 km²; (ii) full MMDM was 7.56±0.9 tigers per 100 km²; and (iii) a spatial likelihood-based approach of computing density directly from trapping data was 7.90±2.05/100 km² using an inverse prediction (ip den) spatially explicit model and 7.74±1.36/100 km² using maximum likelihood (ML den).

Ecological Assessment of Timberline Ecotone in Western Himalaya With Special Reference to Climate Change and Anthropogenic Pressures



Funding source:

Grant-in-Aid

Investigators:

Dr. B.S. Adhikari and Dr. G.S. Rawat

Researchers:

Sabuj Bhattacharyya, Ishwari Dutt Rai and
Rupesh Ranjan Bharti

Date of initiation:

May 2007

Date of completion:

May 2011

Objectives: The objectives of the project are to: (i) study the status and structural and functional aspects of timberline vegetation along the gradients of anthropogenic pressures; (ii) compare the status of selected indicator species of flora along the timberline within and outside protected areas; (iii) compare the abundance of selected mammals and pheasants in the disturbed and undisturbed timberline ecotones based on direct and indirect evidence; (iv) assess the spatio-temporal changes in the timberline (contiguity, vertical and horizontal extent and interspersed) using remote sensing and GIS; and (v) develop models for predicting future scenarios along sub-alpine-alpine ecotones in the event of climate change and continued anthropogenic pressures.

Progress: The data were collected to compare the yearly differences in phenological stages for all major species, *viz.*, *Abies spectabilis*, *Quercus semecarpifolia* and *Betula utilis*. During the vegetation survey a saprophytic orchid *Corallorhiza trifida* was recorded in the Valley of Flowers National Park. The Himalayan musk deer, Himalayan tahr, red fox and Himalayan monal were found to utilize the timberline year round. The movement of the common leopard in the timberline zone was found to be related to the movement of livestock. The relative abundance of a native

small mammal of the timberline, Royle's pika, was studied and correlated with the inter-annual variation in snow cover, atmospheric temperature and precipitation. The activity of Royle's pika was relatively high at dawn and dusk and low during the daytime. The extent of timberline forests was determined through vegetation mapping of protected areas, *viz.*, Nanda-Devi National Park, Valley of Flowers National Park and Kedarnath Wildlife Sanctuary, and the changes over the last two decades were analysed through remote sensing.

Output and outcomes: A comparative study of phenology revealed a shift in various phenological stages. After an initial early growth, the later stages were delayed as compared with the previous year. This was due to early snow-free soil and year-round low soil temperatures. The growth of herbaceous species was also retarded in 2009. The relative abundance of Royle's pika depends significantly on the inter-annual variation in snow cover, atmospheric temperature and precipitation. A change detection study revealed that very little change in the timberline over the last two decades. *Quercus semecarpifolia*, as the major timberline forming species, covered the maximum area, followed by *Abies spectabilis*, *Betula utilis* and *Rhododendron campanulatum*, in the above-mentioned protected areas. Most of the changes occurred in the oak and *krummholtz* class, while *Betula* and *Abies* underwent almost no change. These observed changes were based on NDVI image differencing, which was not sufficient to understand the nature of change (conversion of land cover). The distribution of conifers in Kedarnath Wildlife Sanctuary showed an increasing trend towards the western region. A more detailed change detection study based on multi-temporal image analysis will be done to understand the real magnitude and nature of the changes in the protected and non-protected areas of the timberline.



B.S. Adhikari

Ecology of Leopard in Sariska Tiger Reserve, Rajasthan



Funding source:

Investigators:

Researchers:

Date of initiation:

Date of completion:

Grant-in-aid

Dr. K. Sankar, Shri Qamar Qureshi and

Dr. Y.V. Jhala

Krishnendu Mondal and Shilpi Gupta

September 2007

September 2012

Objectives: The objectives of the project are to: (i) understand the factors influencing the ranging pattern and home range of the leopard; (ii) collect information on prey selection and habitat use by the leopard; (iii) collect information on the population structure, survivorship and dispersal patterns of leopards; and (iv) develop a conservation action plan for leopards in a semi-arid landscape.

Progress: Two individuals have been radio-collared so far to understand the home range and ranging patterns of the leopard. One male leopard (L1) was collared on March 27, 2009 and was fitted with a Telonics VHF radio-collar. Data on the ranging patterns and habitat use of this animal were collected up to December 18, 2009, till the animal died. In total, 148 locations were obtained for L1 using the “homolog-in” and “triangulation” methods. Information on the major vegetation type, terrain type and distances to nearest water source, human habitation and road were also collected from leopard location. The home range was estimated using Mapsource, GPS Trackmaker and ArcGIS 9.2. Another male leopard (L2) was radio-collared on October 28, 2009. This animal was also fitted with a Telonics VHF radio-collar. A total of 234 locations of this animal were collected during the reporting period. Line transect sampling and scat analysis of leopards were carried out to understand the prey availability, prey selection and food habits of leopards. Thirty-two line transects were walked thrice in each season in the study area. The total length of the transects was calculated to be 58 km, and total effort was 174 km walk. To study the food habits, 90 leopard scats were collected, washed and analysed to identify the prey remains.

During the study period, 40 camera trap stations were established and camera trapping was done in an area of 118.7 km². Trapping sites were selected based on the presence of tracks, scats and other evidence indicative of frequent leopard activity so as to maximize the capture

probabilities of leopards. The leopard density was estimated through the mark-recapture framework. Camera trapping was carried out for 130 days (65 occasions) in two 80 km² blocks.

Outputs and outcomes: The home range of the first leopard (L1) was estimated to be 95.3 km². The winter home range of L2 was estimated to be 325.5 km², which is large when compared with other findings. The study area was found to hold a high prey density of 81.4 ungulates/km². The density of peafowl was found to be the highest (103.1/km²), followed by those of the chital (41.3/km²), cattle (28.9/km²), nilgai (23.3/km²), goat (22.1/km²), buffalo (20.3/km²), sambar (16.8/km²), common langur (11.7/km²) and wild pig (6.8/km²). Leopard scat analysis revealed that the sambar was the principal prey species of the leopard in terms of number and biomass. Sambar and chital together constituted nearly 62% of the diet of the leopard. Nine prey species were identified from leopard scats. The sambar's frequency of occurrence (45.5%) was the highest in leopard scats followed by the chital (15.2%), nilgai (8.9%), cattle (7.1%), common langur (6.3%), peafowl (6.3%), rodents (5.4%), hare (2.7%) and wild pig (2.7%). The prey preference of the leopard was in the following order: sambar>common langur>chital>nilgai=wild pig>peafowl>cattle. From the kills identified in the field, sambar was found to be the principal prey (37.9%), followed by the domestic goat (20.7%), chital (17.2%), domestic cow (13.8%) and nilgai (10.3%).

A total of 61 leopard photographs were obtained, with 14 identified individuals. The data were analysed using the CAPTURE and DENSITY 4.1 programs. These programs selected the null (Mo) estimation as the appropriate model. The estimated leopard population was 14.0 with 0.6SE (223 km² trapping area). The estimated leopard density was 6.2/100 km² with 0.8SE in MCP with the half MMDM model.

Study of Bird Species Numbers and Densities in the East and West Himalayas



Funding source:

Grant-in-Aid and University of Chicago (NSF)

Investigators:

Dr. Dhananjai Mohan, Shri Pratap Singh (WII) and Dr. Trevor Price (University of Chicago, NSF)

Researcher:

Mousumi Ghosh

Date of initiation:

January 2007

Date of completion:

December 2011

Objectives: To understand the species distribution, densities and habitat associations in the eastern and western parts of the Himalayan range, primarily by comparing the two locations. This includes an assessment of the phylogenetic relationships among species.

Progress: Fieldwork was undertaken in Buxa Tiger Reserve, Neora Valley National Park (NP), West Bengal; Nokrek NP and Nonkhylllem Wildlife Sanctuary (WLS), Meghalaya; Mehao Sanctuary, Arunachal Pradesh; Khangchendzonga NP, Sikkim; Kedarnath WLS, Uttarakhand; and Manali WLS, Himachal Pradesh. During 2009-2010, a proposal to extend the work was cleared by TRAC. The proposal was to

compare the populations of the same species in the west and the east, using genetic markers. The genetic analysis work is being carried out currently in India, and the sequencing is likely to be completed by July 2010.

Output and outcomes: More than 2000 bases of NADH dehydrogenase subunit 2 (ND2) and cytochrome b (cytb) mitochondrial sequences were obtained for ~80% of the 427 passerine species. Initial analysis along the elevational gradient in Arunachal Pradesh showed a greater phylogenetic turnover between 1200 m and 2400 m, lending support to the *niche conservatism* historical hypothesis.



Black-crested Bulbul: Dhananjai Mohan

Developing Spatial Database on the Mammal Distributions and Monitoring Programme for Large Carnivores, Prey Populations and Their Habitats in Khangchendzonga Biosphere Reserve, Sikkim



Funding source:

Grant-in-Aid

Investigator:

Dr. S. Sathyakumar

Researchers:

Tapajit Bhattacharya, Tawqir Bashir and
Kamal Pondyal

Date of initiation:

January 2008

Date of completion:

December 2011

Objectives: The objectives of the project are to: (i) develop spatial database for the distribution of mammals particularly large carnivores and their prey (ungulates, galliformes) in the different watersheds of Khangchendzonga Biosphere Reserve (BR); (ii) investigate habitat use patterns of ungulates and galliformes and food habits of carnivores in Khangchendzonga BR; and (iii) develop a monitoring programme for the monitoring of large carnivores and their prey (ungulates, galliformes) and their habitats in Khangchendzonga BR.

Progress: Field investigations continued in different parts of the *Prek chu* catchment (intensive study area) of Khangchendzonga BR during the reporting period. The study area was divided into 2x2 km grids and camera traps were placed along trails in every grid to obtain data on presence/absence, relative abundance and population of carnivores, ungulates and galliformes. Trail sampling and scanning methods were used for collecting data on carnivores, ungulates and galliformes based on direct and indirect evidences. All field activities were carried out in the form of field expeditions *i.e.* camping in different areas of the *Prek chu* water shed. Studies in the sub-alpine region were carried out in the first and second advance camps, Tsokha (3,000 m) and Dzongri (3,900 m). Thansing (4,000 m) and Lampokhri (4,200 m) were the third and fourth advance base camps respectively, from where studies in the alpine region were carried out.

Outputs and outcomes: The presence of 17 species of carnivore was confirmed from camera trap photographs, direct sightings and indirect evidence. The photo capture rates of the red fox ($1.93 \pm 0.77/100$ days) and Himalayan yellow-throated marten ($1.07 \pm 0.37/100$ days) were higher compared with other carnivores. According to the capture

rates, the decreasing order of rarity of the species is as follows: red fox > Himalayan yellow-throated marten > leopard cat > golden cat > Asiatic black bear > Himalayan masked palm civet > large Indian civet > stone marten > wild dog > snow leopard > red panda > clouded leopard. In the case of the red fox and yellow-throated marten, the detection probability was higher, while the site occupancy was higher in case of the golden cat. In spite of having the highest site occupancy, the golden cat had a lower detection probability, as the number of photographs was small compared with those of the red fox and yellow-throated marten. In total, 117 scats of the snow leopard, 55 scats of possibly the common leopard, 273 scats of the red fox, 72 scats of martens, 42 scats of weasels and 83 scats of other carnivores were collected.

Seven species of ungulate were encountered in the study area. The presence of the goral, barking deer, serow, musk deer, blue sheep and wild pig was confirmed through direct and indirect evidence. The presence of the Himalayan tahr was confirmed in the study area only through camera trapping. The blue sheep was the most encountered species, followed by the goral > serow > musk deer. In 3750 camera trap nights, the goral had the highest capture ($n=156$) and corresponding capture rate ($5.20 \pm 2.68/100$ days). This was followed by the serow with the next highest capture ($n=39$) and capture rate ($1.27 \pm 0.57/100$ days). Other ungulates had a capture rate of <1 . The rarity for ungulates decreases as follows: musk deer > Himalayan tahr > blue sheep > serow > goral. The site occupancy was highest for the serow and decreased in the following order: serow > Himalayan tahr > goral > blue sheep > musk deer. The blue sheep had the highest detection probability (0.55 ± 0.09) among all the ungulates. The serow had a low detection probability (0.27 ± 0.23) but highest site occupancy due to the fact that it

inhabits habitats ranging from sub-tropical to sub-alpine habitats and is solitary in habit, making its detection difficult.

The presence of seven species of galliformes was confirmed through direct sightings, camera trap photos and indirect evidence. These include the blood pheasant, Himalayan monal, satyr tragopan, kalij pheasant, hill partridge, snow partridge and Tibetan snowcock. The blood pheasant was the most frequently sighted species during transect and trail walks. It was sighted on 71 occasions (475 individuals) with an average group size of up to 45 individuals. The overall encounter rate and density for the blood pheasant ($n=71$) were estimated as $0.07\pm0.01/\text{km walk}$ and $10.86\pm2.34/\text{km}^2$, the highest among all the animals encountered in this area. During the study period, the blood pheasant was most common in the fir-birch-rhododendron forests and alpine-scrub regions of the study area. The Himalayan monal was sighted on 20 occasions (40 individuals), and its encounter rate and density were $0.02\pm0.01/\text{km walk}$ and

$0.91\pm0.31/\text{km}^2$, respectively. It was found mostly in sub-alpine and alpine habitats. The snow partridge was sighted on 16 occasions (122 individuals), only in the alpine zone and on rocky and boulder strewn slopes, and its encounter rate was $0.02\pm0.01/\text{km walk}$. There were 10 sightings of the satyr tragopan in fir-birch-rhododendron forests. The kalij pheasant and hill partridge were sighted on eight and nine occasions, respectively, in the oak-dominated mixed wet-temperate forest. In 3750 camera trap nights, the blood pheasant had the highest capture ($n=116$) and corresponding capture rate ($3.8\pm1.58/100$ days).

Milestone: This being the pioneering study on the mammals of Khangchendzonga BR, many mammal species have been confirmed for this area based on the fieldwork and camera trap pictures. Species specific field monitoring methods have been identified and standardized. These protocols will be used to impart training for frontline staff as well for future monitoring.



Himalayan Yellow-throated Martin

An Integrated Approach to Reduce the Vulnerability of Local Community to Environmental Degradation in the Western Himalayas, India



Funding source:

Grant-in-aid

Investigators:

Dr. Ruchi Badola and Dr. S.A. Hussain

Researchers:

Ashi Qureshi and Pariva Dobriyal

Date of initiation:

January 2007

Date of completion:

January 2011

Objectives: This project aims to develop an integrated plan to reduce the vulnerability of local community to environmental degradation in the Western Himalayas. The major objectives of this project are to: (a) enumerate the key ecosystem functions of the Western Himalayan forested landscapes and estimate the values of major services provided by it (following ecosystem services will be valued – Carbon sequestration, source of water, nutrient retention, protective function such as soil erosion, flood and landslide prevention, and recreation); (b) study the patterns of interaction between the local livelihoods and natural ecosystems; (c) identify the key drivers of land use and resource use changes that have taken place in the region and assess their implications for ecosystem integrity and vulnerability of the people; (d) identify ecosystem management actions and sustainable livelihood options that may reduce the vulnerability of communities to environmental degradation; and (e) promote the integration of this approach into emerging policy frameworks for sustainable use of natural resources in the region.

Progress: During the current year, the value of the carbon stock, nutrients and water content was estimated using the standard methodologies in different land use and land cover classes (LU/LC) of the Biosphere Reserve. Plot method for the biomass estimation has been followed in the different LU/LC. Plots were laid to determine the carbon stock and data were collected for (i) above ground biomass, (ii) below ground biomass, (iii) litter, and (iv) soil organic carbon. For 10 LU/LC classes, 10x10 m plot was laid in eight sites. Site selection was done on the basis of the forest types and slope. For the soil organic carbon and nutrient retention in the different LU/LC, soil samples at different depths (0-30 cm) were collected by laying small plots within the plots for biomass estimation. The chemical analysis for the different nutrients (C, N, P, and K) is under process.

Outputs and outcomes: Among the five different forest types of Nanda Devi Biosphere Reserve (NDBR) studied, the tree density was highest for oak forests (763.6 ha⁻¹), followed

by conifer mixed forests (588.2 ha⁻¹) and lowest for blue pine forests (561.5 ha⁻¹). Similarly, tree basal area was also highest for oak forests (168.6 ha⁻¹), followed by conifer mixed forests (105.04 ha⁻¹), and deodar forests had the lowest basal area (41.1 ha⁻¹).

Oak forests had the highest sapling density (10,961.5 ha⁻¹), followed by conifer mixed forests (9326.9 ha⁻¹), while deodar forests had the lowest sapling density (7500 ha⁻¹). The seedling density was highest for deodar forests (35,454.6 ha⁻¹), followed by blue pine forests (19,629.6 ha⁻¹), while oak forests had the lowest seedling density (14,021.8 ha⁻¹).

Among the forest types of NDBR studied, the highest tree carbon content was in oak forests, with 5020.8 t ha⁻¹ in the above ground parts (AGP), and the carbon content in the below ground parts (BGP) was also significantly higher for this forest (1305.4 t ha⁻¹). Conifer mixed forests followed oak forests in tree carbon content, whereas the tree carbon content in the above ground (517 t ha⁻¹) and below ground parts (134 t ha⁻¹) were low for deodar forests.

Alpine grasslands were more efficient in carbon accumulation, with 0.41 t ha⁻¹ in the AGP of the grassland vegetation and 0.11 t ha⁻¹ in the BGP, whereas low altitude grasslands have 0.38 C t ha⁻¹ in the AGP and 0.01 C t ha⁻¹ in the BGP. The soil organic carbon content was also higher in the soils of the alpine grasslands (0.021 t ha⁻¹), compared with the low altitude grasslands (0.011 t ha⁻¹). Among human modified areas, agricultural lands are far better than orchards in their ability to accumulate carbon.

Orchards extend over a greater area than agriculture, and so the total carbon stock for orchards was higher, with 0.60×10⁶ ton and 224.41 C ton ha⁻¹ (0.12%), whereas for agriculture the total carbon stock was 0.42×10⁶ ton and 201.85 C ton ha⁻¹ (0.09%). Our primary results yielded estimates of the total carbon stock of the different land uses and land cover classes studied to be 481.81×10⁶ ton.

A study on sympatric carnivores (tiger, leopard and wild dog) in Mudumalai Tiger Reserve, Tamil Nadu



Funding source:

Grant-in-aid

Investigators:

Dr. K. Sankar and Shri Qamar Qureshi

Researchers:

T. Ramesh and Riddhika

Date of initiation:

January 2008

Date of completion:

January 2011

Objectives: (i) To estimate the density, distribution, group size and composition of prey species of sympatric carnivores (tiger, leopard and wild dog); (ii) to study the food habits and prey selectivity of sympatric carnivores; (iii) to estimate the population of sympatric carnivores; (iv) to study the distribution of sympatric carnivores and their prey species with special reference to anthropogenic pressure; and (v) to develop a conservation action plan for these sympatric carnivores.

Progress: Twenty line transects and five vehicle based transects were laid in the intensive study area (107 km²) to estimate the prey species density. For each sighting, information on the number of prey species, sighting angle and angular sighting distance were recorded. Line transect data were analysed for two dry seasons and one wet season. A total of 873 tiger scats, 386 leopard scats and 1007 wild dog scats were collected to study the food habits of sympatric carnivores. Out of these, 618 tiger scats, 321 leopard scats and 909 wild dog scats were analysed for prey remains. The dietary overlap between tiger, leopard and dhole was estimated using the overlap index. Every year, at least 70 days of camera trapping sessions were carried out to estimate the large carnivore population. Data were analysed

using the DENSITY 4.0 program to estimate the tiger and leopard populations by the mark-recapture method. The wild dog population was estimated by compiling three seasons' vehicle transect data using the DISTANCE 5.0 program.

Villages present inside the tiger reserve were surveyed to understand the carnivore distribution in relation to biotic pressure. The anthropogenic data (wood cutting, lopping, grazing, livestock dung, minor forest produce collection, etc.) were collected at every 400 m by sampling 10 m radius plots along the line transects. Information on human-large carnivore conflicts was also collected from the villages.

Outputs and outcomes: The common langur was the most common prey species, with a density of 38.4±5.1 animals/km², followed by the chital (29.2±7.7 animals/km²), gaur (9.4±2.6 animals/km²) and sambar (5.4±1.1 animals/km²). The overall ungulate and primate density together constituted 84.8 animals/km². The estimated mean biomass of the potential prey species was 6244 kg/km².

Scat analysis revealed the presence of 14 prey species in tiger scats, 15 prey species in leopard scats and 12 prey species in dhole scats. Ninety-seven percent of tiger scats contained a single prey species, and 3% contained two prey species. Similarly, 96% of leopard scats contained a single prey species, and 4% of leopard scats contained two prey species, while 98% of dhole scats contained single prey species and 2% contained two prey species.

Camera trapping identified 24 individual tigers (six males, 16 females and two unclassified individuals) and 38 individual leopards (11 males, 23 females, three cubs and an unclassified individual). In 2009, the density estimate (individuals/100 km²) of the tiger was 8.3±2.4SE and that of the leopard was 16.2±3.9. The density estimate (individuals/100 km²) of the dhole was 43±25SE.



T. Ramesh

An Assessment of Entomofauna for Management and Conservation of Biodiversity in the Gangotri Landscape



Funding source:

Grant-in-aid

Investigator:

Dr. V.P. Uniyal

Researchers:

Manish Bhardwaj and Abesh K. Sanyal

Date of initiation:

January 2008

Date of completion:

January 2012

Objectives: The objectives of the project are to: (i) assess the ecological diversity and distribution patterns of beetles (Coleoptera) and butterflies (Lepidoptera) in the Gangotri Landscape; (ii) determine the status of beetles (Coleoptera) as pests in different forest types in the landscape; (iii) determine the impact of anthropogenic pressures on assemblages of butterflies and beetles; and (iv) suggest and develop long-term management strategies for conservation of invertebrate diversity in the landscape.

Progress: Sixty transects were laid in six different altitudinal zones (1200-4000 m) to record data on Coleoptera and Lepidoptera. Transects were sampled systematically (20 each in the 500 m altitude zone) within a stratified stratum to ensure an independent sampling protocol. Beetles were sampled using four methods: (i) aerial and ground hand collection, (ii) sweep netting, (iii) light traps and (iv) direct searching along transects. Direct searching involved looking up and down while moving along a transect (50 m) and listing possible beetle species encountered. Nocturnal beetles and moths were sampled using light traps. Transects of a minimum length of 300 m were laid in six different altitudinal zones to document the butterfly diversity. Butterflies were recorded within a 10 m space around the transect. The moths were collected using light traps running for 4 hours from 7 pm to 11 pm in the three seasons, viz., summer (April-May), monsoon (June-July), and post-monsoon (August-September). After collecting, moths were treated with benzene vapour in a jar. The freshly killed specimens were pinned, stretched, dried and preserved in air-tight wooden boxes.

Outputs and outcomes: A total of 105 morpho-species of Coleoptera (beetles) were recorded, out of which 60 specimens were from 17 families, and a total of 116 species

belonging to Lepidoptera (including butterflies and moths) were recorded from the study area. The details of species are as follows:

(a) 84 species of butterflies were recorded in 49 genus and five families on 140 transects in 85 days of fieldwork. *Pieris canidia* (Indian cabbage white) (n=455) was the species with the highest number of individuals recorded. The butterfly diversity was highest in mixed forests (2.5). Pine forests were found to harbour the most even (Shannon J index 0.89) butterfly community, while the evenness was the lowest (0.79) for alpine forests. Cluster analysis showed that agricultural lands and mixed forests were similar with 64% similarity. The highest butterfly diversity was recorded in the monsoon season. Among all the five families reported, the largest number of species was accounted for by Nymphalidae (45 species and 697 individual). Considering chao1 as the appropriate estimator with an estimate of 134 species, it could be assumed that around 49% of the butterfly diversity was sampled in the sampled area.

(b) The diversity of moths showed a decreasing trend with increasing altitude. A total of 208 specimens were collected in four sampling seasons. According to the morphological distinctness, 169 specimens were assigned to the morpho-species category keeping in mind the sexual morphs. Fifteen major families were identified. Of the 208 specimens representing 169 morpho-species, only 31 were identified up to species rank, representing six superfamilies and nine families within the short span of the study period.

Ecological Effects of Road Through Sensitive Habitats: Implications for Wildlife Conservation



Funding source:

Grant-in-aid

Investigators:

Dr. Asha Rajvanshi and Dr. V. B. Mathur

Researcher:

A. Pragatheesh

Date of Initiation:

April 2008

Date of completion:

March 2011

Objectives: The objectives of the project are to: (i) assess the nature of the ecological effects associated with roads based on the study of existing road sections aligned through or along an ecologically sensitive area; (ii) predict the nature of ecological effects of a proposed road upgradation (four laning from two lanes) project with and without mitigation measures; (iii) evaluate the effectiveness of proposed mitigation based on a study of road projects implemented earlier; and (iv) suggest effective measures for preventing road induced impacts for harmonizing conservation and development.

Progress: To address the first objective, studies had already been initiated on National Highway NH-7 in the stretch between 597 and 652 km passing through Pench Mowgli Sanctuary of Pench Tiger Reserve. Fieldwork is under progress to assess the use of the existing road by wild animals and to determine the crossing zones for select species and the suitability of various underpasses and overpasses for animal movement across the road.

During the study period, 19 transects were laid on both sides of the road to assess the distribution and the usage of habitat

by wild animals. The presence of animals was recorded at every 100 m on the line transect based on direct evidence. Indirect evidence was collected at every 100 m within plots of radius 20 m.

To collect direct and indirect evidence on the distribution of the animals along the road verge, seven permanent line transects (2 km length) were laid proportionately and systematically in each habitat type on both sides of the road. To evaluate the use of roads by wild animals, continuous monitoring was done along the stretch of the road for 24 hours using vehicle transects. Roadside counts were based on direct observations and indirect evidence (pellets, scrape marks, pugmarks, hoof marks, etc.) to determine crossing zones and the distribution of animal species along the road edges. For monitoring the use of different underpasses (36 underpasses), track plots were laid on both ends of the underpasses to assess the use by animals.

The traffic volume was determined from secondary records and round the clock continuous monitoring for three days every month. For estimating the road related mortality of animals, the entire road stretch was surveyed daily during the early morning and late evening hours.

Outputs and outcomes: Observations were made on road kills and injured individuals of all species, and information regarding the state of the road kills, location and habitat features was recorded. The findings of the study indicated that the road related mortality of animals was high (227 records of road kills in 210 days of field observations). The most vulnerable group was snakes, followed by birds and mammals. The size, structure and location of underpasses influence the use of passages by animals. Passages with dimensions greater than 3 m×3m (height and width) were preferred more.



A. Pragatheesh

Ecology of Lions With Emphasis on the Agro-pastoral Landscapes of Greater Gir Ecosystem



Funding source:

Grant-in-aid

Investigators:

Dr. Y.V. Jhala and CCF (Wildlife), Junagadh Circle, Gujarat

Researchers:

Kausik Banerjee and Parabita Basu

Date of initiation:

April 2009

Date of completion:

March 2012

Objectives: This project aimed to investigate the metapopulation dynamics of lions in the Greater Gir landscape with emphasis on population estimation and the demography of lions outside the Gir PA. The study looked at the ranging, dispersal and movement pattern of lions inside and outside the Gir, food habits of lions outside the Gir PA, and high resolution mapping of the Gir landscape to better understand the factors responsible for animal distribution patterns and land use patterns and to develop habitat suitability models for lions and the principal prey species. The economics of lion conservation (livestock predation versus agriculture damage control) in the landscape is also aimed at radio-telemetry and studying the perception of the local populace towards lion conservation in the region to maintain the lion population outside the PA at an ecologically and socially acceptable level.

Progress: The lion population was estimated in a mark-recapture framework of population estimation with the identification of individual lions on the basis of well validated vibrissae patterns and permanent body markings. A potential “corridor” habitat-matrix between Girnar and the Gir PA was identified. Seven male lions and three lionesses of different age groups belonging to different coalitions and spaced throughout the Greater Gir Landscape were radio-collared (combination of satellite/GPS/VHF telemetry) until January 2010. Data on demography were obtained by classifying lion sightings to gender and seven age categories (based on size, body coloration and teeth wear). Cub survival was monitored for 45 cubs in 19 litters of 17 females across the Greater Gir Landscape (30 cubs in 12 litters from 10 females outside the Gir PA and 15 cubs in seven litters from seven females from the Gir PA) between January 2007 and December 2009. Food habits outside the Gir were ascertained on the basis of *ad libitum* observations of lion kills.

Outputs and outcomes: The density of adult lions in the Girnar Wildlife Sanctuary (180 km²) was estimated as $6(\pm 0.7SE)/100 \text{ km}^2$. Population viability analysis (PVA) emphasizes the importance of immigrants for the long-term (100 years) persistence of this small population by reducing the extinction probability by 16%. To permit a continued exchange of genetic material of lions between the “source” (Gir) and “sink” (Girnar), a corridor habitat-matrix area of approximately 1406 km² covering revenue and private lands of 90 villages of Junagadh, Bhesan, Visavadar, Mendarda and Dhari tehsils were identified and proposed as an “Eco-sensitive Zone” emphasizing eco-restoration of the habitat and curtailing further “lion-hostile” developmental activities in the region. The land in the habitat of this corridor included croplands (35%), broken terrain characterized by dry river systems (20%), a network of roads (15%), waterbodies (13%), scrubland (10%) and dense forested patches (7%). GPS telemetry data from one of the radio-collared males in Girnar strongly corroborated the speculation that the male made to and fro movements from the Girnar to Gir within six days in January 2010 through the corridor habitat landscape, passing through revenue lands of 35 villages, and mostly used dry river channels and the network of roads in the area.

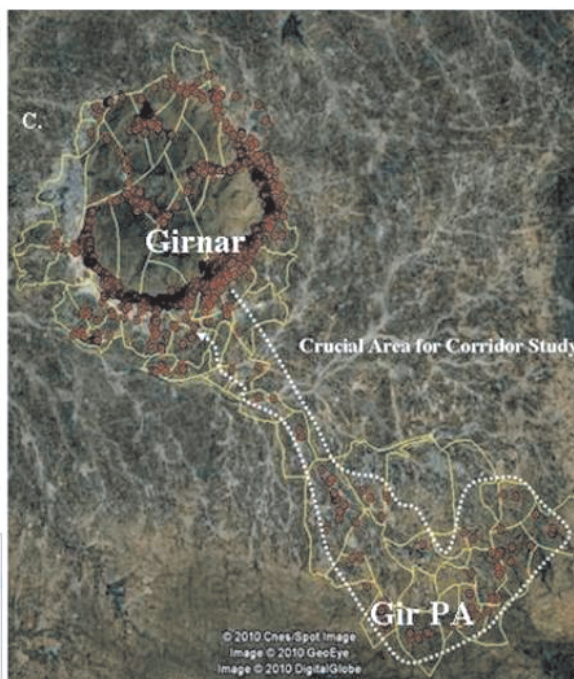
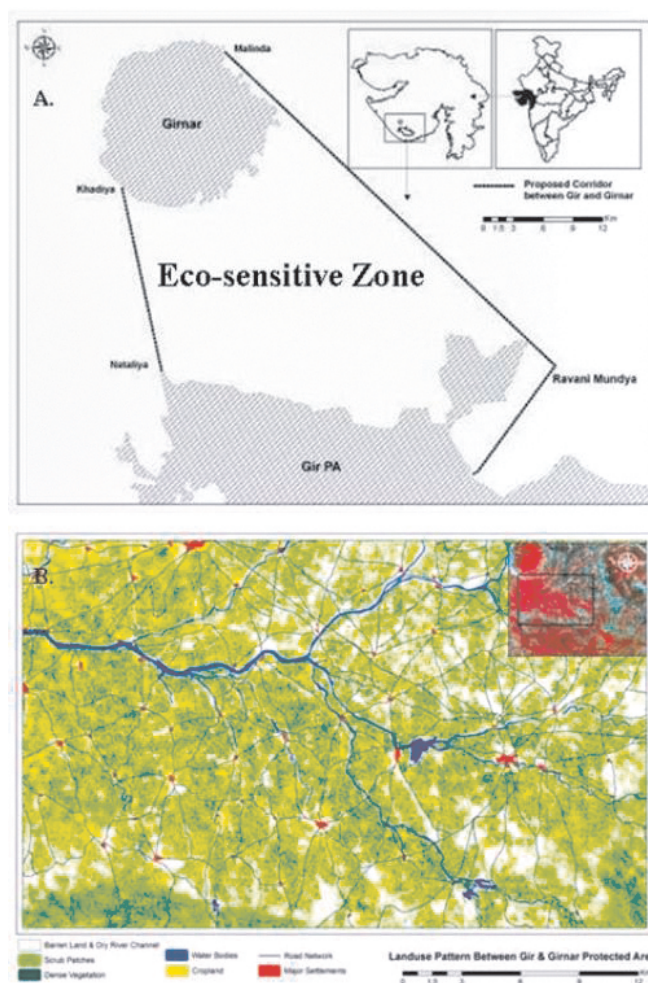
Girnar Wildlife Sanctuary and the eastern satellite belt of Amreli and Bhavnagar districts had a healthy growing lion population with the majority (63% in the Girnar Wildlife Sanctuary and 32% in the eastern satellite pocket) in the recruitment class. The group size of male lions ($\pm SE$) was 1.2 ± 0.18 (1-2, $n=7$) in the Girnar Wildlife Sanctuary and 1.5 ± 0.1 (1-3, $n=29$) in the eastern satellite belt, while the female group size ($\pm SE$) was 1.6 ± 0.35 (1-4, $n=12$) in Girnar Wildlife Sanctuary and 1.05 ± 0.05 (1-2, $n=18$) in the eastern satellite belt.

The male:female ratio was female biased (87:100) in Girnar Wildlife Sanctuary and male biased in the eastern agro-pastoral landscapes (161:100), reflecting availability of less habitat patches conducive for breeding lionesses in the latter. The average detected litter size was 2.4 (SE 0.1). Cub survival in the first, second and third years was 77.9% (SE 4.4), 80.8% (SE 5.7) and 93.1% (SE 4.7), respectively, with an overall survival up to recruitment of 34.3% (SE 7.1). The adult annual survival rate estimated from radio-collared lions was 95% (SE 1.8). The lion mortality ($n=86$ *ad libitum* mortality events) was related to both natural causes (51.2%) and human-induced causes (48.8%). Lions outside the Gir PA had a large home range (\pm SE), with territorial males ($n=3$) having a range of 949 ± 121 km² and those of dispersing sub-adults and ousted dispersing males ($n=4$) being about 772 ± 385 km².

Seventy percent of the lion kills ($n=22$) in Girnar Wildlife Sanctuary was found to be of wild ungulates, while in the eastern satellite belt, 30.9% of the lion kill ($n=87$) was of wild

ungulates. The nilgai constituted 43% of the lion kills in Girnar Wildlife Sanctuary, while in the eastern satellite landscape domestic livestock constituted over 50% of the lion kills. The eastern landscape has several private run charitable *goshalas* and *panjrapols* (cattle sheds for looking after diseased and distressed livestock, especially cattle) containing several hundreds of cattle, which provided lion a softer prey base, as reflected by the higher percentage of cattle kills in this human dominated landscape.

Lions outside the Gir PA were found to be non-selective for any particular habitat at night as they even ventured inside human habitations in search of livestock, but they do need habitat patches as day time refuges and the size of these patches varied from a maximum of 32.610 km² to a minimum of 0.01 km². Identification and conservation of these patches, along with the habitat linkages, is crucial for the long-term persistence of lions, especially breeding lionesses, in the agro-pastoral landscapes outside the Gir PA.



A. Location of potential Gir-Girnar corridor proposed as "Eco-sensitive Zone" (Banerjee *et al.*, 2010)
B. Major land-use classes in the corridor habitat landscape
C. Radio-fixes of to and fro movement between Girnar and Gir by the radio-collared Girnar male lion across the corridor landscape

Study of Impacts of Biotic Disturbances on Forest Birds Communities in Selected Areas of Uttar Pradesh and Uttarakhand



Funding source:

Grant –in-aid

Investigators:

Dr. Dhananjai Mohan and Shri Pratap Singh

Researcher:

Monika Kaushik

Date of initiation:

May 2009

Date of completion:

September 2011

Objectives: Small extractive disturbances such as lopping, grazing, firewood collection, fire and biological invasions are the most widespread pressures on forests in developing countries. Although biodiversity is facing serious threats due to such activities in the majority of the protected areas in India, little work has been done to understand the impact of such activities on the flora and fauna. Considering the need to decipher the role of these small and gradual disturbances on the faunal components of the forest, the present study was formulated with the following objectives: (i) study of influence of biotic disturbances on the avifauna of the western Himalayan foothills tract; (ii) identify indicator birds for various disturbance regimes; and (iii) develop a simple bird habitat monitoring protocol based on the above findings.

Progress: In order to assess the impact of various disturbance factors on the bird communities, sampling plots were located and marked across a disturbance gradient in three dominant vegetation types, namely (i) dry sal, in the southern side of Rajaji National Park (RNP), (ii) moist sal, in the northern side of RNP and Dehra Dun Forest Division, and (iii) *Anogeissus latifolia* tracts in the hilly slopes of RNP. For the selection of sites, a lot of support was taken from various sources, including old forest management plans, forest staff and Google earth images. Several field visits were undertaken to select the sampling plots in different disturbance categories. A total of 19 plots (12 in RNP, five in Dehra Dun Forest Division and two in Shiwalik Forest Division) were marked. In each plot, nine points were marked for collecting data on vegetation, disturbance and birds. A total of 171 points were marked during this period. Around each point, an area of 10 m radius was delineated for vegetation sampling and an area of 20 m radius was delineated for disturbance sampling. Each plot was visited

three times for bird sampling. Approximately 70 days were spent for bird sampling in the entire study period. A total of 121 species of bird were recorded over the entire fieldwork.

Output and outcomes: As this was the project initiation year, the major task was to locate and mark the sampling plots on the ground for data collection. Data on vegetation and disturbances was collected for the winter season in order to find out the various disturbance factors and their impact on the forest. The data will be analysed to understand the impact of small extractive disturbances on the forest structure and composition. Further, data on birds was collected in different disturbance categories using the point-count sampling method. Point-count data collected during winter will be analysed to uncover the impact of a suite of disturbances on the bird community structure and composition. In addition, data will be analysed to find out the impacts on migratory and resident birds separately.

Long-term Monitoring of Vegetation and Biodiversity in WII Campus



Funding source:

Grant-in-aid

Coordinator:

Dr. G.S. Rawat

(As part of the Campus Biodiversity Monitoring Programme, baseline information on various components of biodiversity, viz., the structural and functional aspects of forest vegetation, alien invasive species, mammals, avifauna, herpetofauna and butterflies, was collected. A report on one component, *i.e.*, **Ecology of the Tricarinate Hill-turtle *Melanochelys tricarinata* & other Testudines in WII Campus**, is summarized below.)

Investigators:

Shri R. Suresh Kumar, Dr. Bilal Habib and
Dr. Gautam Talukdar

Date of Initiation:

July 2009

Date of completion:

Ongoing (long-term)

Objectives: (i) Continuation of the baseline study initiated earlier on the tricarinate turtle in the campus and extension of this study to the nearby sal forest. (ii) Initiating similar studies on the other testudines, the yellow-headed tortoise *Indotestudo elongata* (IUCN status-endangered) and Indian black turtle *Melanochelys trijuga* (IUCN status-near threatened), occurring in the campus. (iii) Tracking turtles to understand their movement pattern and habitat use. (iv) Studying the nesting biology of these species. (v) Identification and mapping of critical habitats of the turtles within the campus and the adjoining sal forest. (vi) Studying the foraging ecology and role of turtles as seed dispersers. (vii) Understanding the mechanisms that support the co-existence of the three species within the campus.

Progress: Initially, capture and recapture of turtles was taken up to estimate the population of the species within the WII campus, and later radio-tracking of turtles was initiated to study their movements. Since there were difficulties with the radio-telemetry equipment, the information generated was not as desired. Therefore alternative techniques were explored for intensive tracking of the turtles. Modified thread spools were used to map the trails of the turtles, and

information on their activities was obtained.

Outputs and outcomes: Twenty-two turtles (11 males and females each) were monitored during the study. Four of them were continuously monitored using the thread spools. Preliminary analysis suggests that turtles are territorial and have an average home range of less than 1 ha in the case of females and around 3 ha in the case of males. The turtles were found to be most active during the monsoon months from June through September. Following this, the turtles were found to remain inactive throughout the winter and early summer months. No nesting of the species was found during the monsoon period. In September, a few female turtles showed a marked increase in body weight. Following this, the female turtles were x-rayed as per protocol and the presence of eggs was discovered. Currently these turtles are being monitored for nesting.

A study on the efficacy of different sampling techniques to quantify the abundance of tricarinate turtles within the campus was taken up for a M.Sc. dissertation research project. Another M.Sc. dissertation research project, "Geospatial Modeling of Habitat Connectivity for Tricarinate Hill-Turtle in WII Campus", was taken up.



Tricarinate Hill-Turtle: R. Suresh Kumar

Determining the Offshore Distribution and Migration Pattern of Olive Ridley Sea Turtles (*Lepidochelys olivacea*) Along the East Coast of India



Funding source:

Director General of Hydrocarbon, Ministry of Petroleum & Natural Gas, Government of India
Shri B.C. Choudhury, Dr. K. Sivakumar (WII) and Dr. C.S. Kar (Forest Department, Orissa)

Investigators:

Researchers:

Subrata Kumar Behera, Satya Ranjan Behera and Sajjan John

Date of initiation:

October 2006

Date of completion:

December 2010

Objectives: The objectives of the project are to: (i) estimate the abundance and spatial distribution of adult and mating turtles off the mass nesting sites in Orissa to determine their critical marine habitat requirements during the breeding season; (ii) study the movement of satellite tagged turtles in the coastal waters along the east coast of India in the Bay of Bengal and beyond; (iii) track the long-range migratory route of the adult olive ridley and to determine the non-breeding area for the ridleys using the east coast of India for nesting; and (iv) determine various other environmental parameters and possible impacts of developmental activities both in the marine and coastal nesting habitats.

Progress: During the second phase of the project, a total of 32 olive ridley turtles (six males and 26 females) were deployed with improved Kiwisat 101 PTTs and a better attachment procedure during January-May 2009. The pattern of tagged sea turtle movements was almost the same as observed during the first phase, and all tagged turtles exhibited a southward movement. Although several turtles reached south of Sri Lanka, they have not crossed the equator and used only the Bay of Bengal and the northern Indian Ocean. Most of the turtles moved along 30 km to 400 km from the shoreline, with a mean distance of 214 ± 176 km from the shoreline. The average distance travelled by tagged turtles in a year was 5416 ± 2521 km, with an average speed of 28 ± 9 km/day.

Outputs and outcomes: Over 10,000 coordinates were obtained from PTT tagged turtles. Fifty percent of these provided good quality data that could be linked to various oceanic habitats. The factors that determine the migratory paths of turtles could be examined using these. It was observed that although the turtles were migrating against the general water current pattern in the Bay of Bengal and the Indian Ocean, they were swimming along local surface

water currents which were circular in pattern at the local scale. With respect to the sea surface temperature (SST), migratory turtles remained within a range of 22.34°C to 31.59°C ($28.43 \pm 0.02^\circ\text{C}$). About 73% of turtle locations had a wind direction towards the north-east, with an average wind speed of 26.1 km/h. With respect to chlorophyll a, migratory turtles preferred to remain in regions with 0.50 mg m^{-3} and within a range of 0.05 to 1.5 mg m^{-3} .

Based on offshore congregation monitoring data, it was observed that the breeding population of olive ridley turtles arrives at the Orissa coast in December every year. The turtles remain in the offshore waters from December to April in multiple congregation patches along Gahirmatha, Devi and Rushikulya within 20 km from the coast, with the highest concentrations within 5 km. Their post-nesting migration to the foraging areas from the Orissa coast begins by May, with the majority of the turtles scattered all along the Bay of Bengal. Migrating olive ridley turtles exhibited a closer-to-the-coast (within 100 km) outward migration after the nesting season and a somewhat distant path (around 300 km) for their return migration to the Orissa coast. From the study, it is evident that during the monsoon season, the turtles were scattered along the Bay of Bengal. Tagged turtles moved all over the Bay of Bengal, and excepting for a very small number of individuals that moved towards the Andaman Sea, the turtles moved towards Sri Lanka. Their return migration to the Orissa coast from their foraging grounds around Sri Lanka started during the first week of November.

Milestone: Five sea turtles have been tagged with PTTs along the southern and west coasts of Sri Lanka in collaboration with the Department of Wildlife, Sri Lanka. These turtles moved towards the Maldives, Gulf of Mannar Marine National Park and Kerala.

Development and Maintenance of Studbooks for Selected Endangered Faunal Types in Indian Zoos

Funding source:	Central Zoo Authority
Investigators:	Dr. Parag Nigam
Researchers:	Dr. Anupam Srivastav and Mandakini Nautiyal
Date of Initiation:	November 2006
Date of completion:	November 2011

Objectives: The project objectives are to compile, update and maintain studbooks of 14 endangered species, *viz.*, the Asiatic lion, Bengal tiger, Indian rhinoceros, tailed macaque, Tibetan wolf, gaur or Indian bison, Nilgiri langur, red or lesser panda, snow leopard, Bhutan grey peacock pheasant, wild dog (dhole), clouded leopard, wild ass and hoolock gibbon, in Indian zoos.

Progress: Pedigree data for six species (red panda, snow leopard, Tibetan wolf, clouded leopard, hoolock gibbon and one-horned rhinoceros) were collected from holding zoos.

Demographic and genetic analysis of the data was carried out using SPARKS 1.5 and PM 2000, and studbooks of the above species were compiled.

Outputs and outcomes: The studbooks of the above six species were compiled. Each studbook included population planning recommendations based on the data received from the holding zoos.



Assessing the Potential Role of Coleoptera (Insecta) as Bioindicators in Simbalbara Wildlife Sanctuary, Himachal Pradesh



Funding source :

Ministry of Human Resource Development
(HRDG-CSIR), Government of India

Investigator:

Dr. V.P. Uniyal

Researcher:

Vinay Bhargava

Date of initiation:

April 2007

Date of completion:

October 2010

Objectives: The objectives of the project are to: (i) study the diversity patterns of beetles (Coleoptera) in Simbalbara Wildlife Sanctuary, Himachal Pradesh; (ii) determine the bioindicator families of Coleoptera and their taxonomy; and (iii) assess the potential use of bioindicator coleopteran families as indicators to monitor the human influence on forest ecosystems.

Progress: A total of 5404 adult beetles were captured which represented 66 families, 95 genera and 194 species, or ~1.13% of the beetle species recorded in the Indian mainland. Further, this proportion included only five families of beetles, viz., ground beetles (Carabidae), tiger beetles (Cicindelidae), dung beetles (Scarabaeidae), rove beetles (Staphylinidae) and long-horned beetles (Cerambycidae). The estimated total species richness using Chao1 was 206.88 ± 2.66 (SD) and using Jackknife2 was 216.32 ± 1.55 (SD) for the complete sample, reflecting and inventory completeness of 92%. Mixed forest habitats had a greater species diversity compared with pure stands and open areas sampled in and around the sanctuary. SFE (1.877) and EPE (1.896) with a moderate degree of disturbance also showed a high species diversity. Further, the Simpson's diversity across habitats ranged from 0.01 (EPE) to 0.03 (PM), suggesting that the probability of getting two individuals of similar species was quite low. The β diversity [J (P: Q)] had quite similar values in the comparison between the habitat pairs in the same season along two subsequent sampling years. The Morisita-Horn index of similarity showed that the SFC and SFE habitats located within and outside the sanctuary were 78% similar; but the similarity between SFC and SFF was quite low at 58%, and EPC and EPE were 53% similar. Bray-Curtis cluster analysis segregated the 13 habitat types into eight cluster groups based upon the percentage of similarity. SFC and SFE were the most similar; followed by PM and BF, followed by EPE and EPC. AL, SY and RP formed the single largest cluster, with three habitats.

KF was the least similar to the other sites. Cumulative ANOSIM showed that the greatest difference in species composition occurred between SFC and SFE ($r=0.89$, $P=0.001$) and between SFE and SFF sites ($r=0.35$, $P=0.001$). The overall average dissimilarity was found to be 87.44. Fifty species contributed around 50% to the difference between groups of sites.

Beetle species recorded from the five bioindicator families were taxonomically identified till species level. The IS plot showed a high numerical value of 90 compared to SFE at 55 and SFF at 47. The abundance of soil and litter-dwelling beetles was higher in the primary forest compared with the logged forest and also other sites.

[SFC: Sal forest control; SFE: Sal forest experiment; SFF: Sal forest fire; EPC Eucalyptus plantation mixed forest control; EPE: Eucalyptus plantation experiment; TP: Teak plantation mixed forest; KF: Khair mixed forest; RP: Riverine; MF: Mixed forest; SY: Jamun mixed forest; BF: Bamboo mixed forest; AL: Agriculture/village land; PM: Pine mixed forest].

Outputs and outcomes: Consequently, not only do the forest habitats of the sanctuary have a greater number of species present, but also the individuals in the community are distributed more equitably among these species. The beetle diversity was not found to be similar in different habitat types, and in monoculture plantations, the overall diversity was found to be low. Comparatively, mixed forest habitats exhibit highly diverse assemblages, possibly due to a higher structural complexity and heterogeneity. The species richness and abundance of the dominant families in each sampling site increased from plantations to pure stand forests to mixed forest stands. Natural forest remnants act as reservoirs of diversity – retaining such forest remnants may help secure a balanced ecosystem in the broad sense and specifically shelter beneficial predatory species.



Funding Source:

Investigators:

Researcher:

Date of initiation:

Date of completion:

Department of Biotechnology, Ministry of Science and Technology, Government of India
Dr. Karthikeyan Vasudevan (WII),
Dr. Ramesh K. Aggarwal (Centre for Cellular and Molecular Biology, Hyderabad) and Dr. Sushil K. Dutta (North Orissa University)

Prudhvi Raj

January 2008

January 2011

Objectives: (i) To document the anuran diversity in “hotspots” and in biogeographically important areas in India; (ii) to create an interactive digital library of photographs, calls and DNA barcodes of known amphibian species in India; (iii) to check barcoding gaps and describe cryptic anuran species; (iv) to create a web-enabled database providing the foregoing information on frog taxa of India with retrievable DNA based/other descriptors.

Progress: Extensive field trips were made in the Eastern Ghats, the western Himalaya, the Central Indian Landscape and north-east India. Sampling locations were pre-selected and anurans were surveyed using the time constraint survey method. Representative anurans were collected, and selected specimens were photographed, euthanized, catalogued, fixed and preserved in 70% ethanol for further morphological studies. Tissues were preserved in absolute alcohol for further molecular studies. Tadpoles were also collected during the present field study and are preserved in 70% alcohol for further studies. Along with samples, field data have been collected for both biotic and abiotic variables.

Outputs and outcomes: In total, >90 primer pairs were designed targeting a number of informative domains, and

these are being standardized using a panel of 24 frog species representing the known anuran diversity from India. This work is under way, but the efforts undertaken are not indicative of a barcode for anurans.

A total of 103 specimens comprising about 30 species of anuran were collected from 26 locations during the reporting period. Acoustic recording of calls of different species of frogs was taken up during the present year. At CCMB, wet lab conditions are standardized for DNA isolation, PCR amplification and sequencing. Barcodes of different domains (both nuclear and organelle) from different species from the present collection were sequenced during the year. The main emphasis has been to design suitable primer pairs, which can be used as universal primers for barcoding anurans. Over 90 primer pairs were designed, targeting a number of informative domains. These were tested using a panel of 24 frog species representing the known anuran diversity from India.

Breeding in anurans is extremely seasonal. They have prolonged larval stages. Even the identity of those tadpoles for which descriptions were made is highly arguable. One potential major application of DNA barcoding in amphibians is certainly the species identification of larvae. In the project, a conscious effort has been made to document the larval stages of important anurans in India. During the past year, the emphasis has been to develop expertise in this field of study. During this study, larvae at different stages of growth belonging to 17 anuran species have been collected from the field or after rearing experiments. This will allow documentation of the larval stages of anuran species that are being identified using species specific DNA barcodes. The description of tadpoles of different species identified from DNA barcodes is at an advanced stage and will be communicated to peer reviewed journals.



Bush Frog: S. Harkrishnan

Survey and Mapping of Commercially Important Medicinal Plants in the State of Uttarakhand



Funding source :	Uttarakhand Forest Department (UKFD)
Investigators :	Dr. G.S. Rawat and Dr. B.S. Adhikari
Advisor/Collaborator :	Dr. S. Chandola, UKFD
Researchers :	Umesh Kumar Tiwari and Ninad V. Raut
Date of initiation :	January 2008
Date of completion :	December 2010

Objectives: The objectives of the project are to: (i) quantify the availability of commercially important medicinal plants in various forest ranges of Uttarakhand (Garhwal region); (ii) generate a spatial database on the distribution and abundance of medicinal plants for future monitoring and conservation planning; and (iii) evolve strategies for sustainable harvesting of medicinal and aromatic plants.

Progress: During the reporting period, the fieldwork for quantification of medicinal and aromatic plants was completed in the following forest divisions: Dehra Dun, Mussoorie, Upper Yamuna, Tons, Uttarkashi, Badrinath, Kedarnath and Narendra Nagar. Data analysis was completed for Dehra Dun, Upper Yamuna and Mussoorie forest divisions, while data entry is in progress for other divisions.

Outputs and outcomes: Based on the preliminary analysis of the data collected from Mussoorie Forest Division (FD), it could be concluded that this division has potential for conservation and development of seven high value medicinal plants, viz., *Bergenia ciliata*, *Hedychium spicatum*, *Swertia chirayita*, *Rubia cordifolia*, *Terminalia belerica*, *Zanthoxylum armatum* and *Gentiana kurroo*. *Swertia chirayita* and *Gentiana kurroo* need immediate conservation measures, i.e., delineation of habitats, restocking of such habitats by the above-mentioned plants from Kadukhal nursery and in-situ conservation near forest rest houses, and other suitable sites. *Rubia cordifolia* and *Hedychium spicatum* were frequently found, and *Valeriana jatamansi* and *Bergenia ciliata* were common in Banj and Banj mixed forests in all ranges. Hence, such forest areas can be considered for in-situ conservation of these species. These species are also recommended for their restocking (development) in Banj oak and oak mixed forests wherever protection can be ensured. *Terminalia belerica* was common in miscellaneous forests of Kempty Range. It is recommended that this area be a permanent seed

resource area (PSRA) and that the species be monitored further. The deodar forests in Devalsari and Bhadrigrad ranges are suitable for conservation and development of *Zanthoxylum armatum*. Phenological monitoring and seed production of this species need to be initiated for further conservation and development of this species.

Based on the preliminary analysis of the data collected from Upper Yamuna Forest Division, it can be concluded that this division has potential for conservation and development of eight high value medicinal plants: *Dactylorhiza hatagirea*, *Gymnadenia orchidis*, *Nardostachys jatamansi*, *Picrorhiza kurroo*, *Jurinea dolomiaea*, *Aconitum heterophyllum*, *Aconitum balfouri* and *Polygonatum* spp. Bhairab Block (compartment numbers 1, 3, 4a and 5) had a higher abundance of these species compared with all other blocks. Hence, these compartments are recommended for the conservation and development of the above-mentioned species. Some of the rare species of MAPs in this division were *Paris polyphylla*, *Arnebia benthamii*, *Rheum moorcroftianum* and *Rheum webbianum*, which need immediate conservation measures. It was recommended that in-situ conservation of these species be carried out in Yamunotri Block (compartment numbers 7, 8 and 10). The greatest number of high value medicinal and aromatic plants in Upper Yamuna was found in the Yamunotri Range, which mainly falls in the sub-alpine and alpine zones. For the conservation and development of the medicinal plants in this range, *Berberis* species and certain alpine herbs are recommended. However, there is hardly any species that is available for commercial harvest at present. A few localities in Upper Yamuna FD will require repeat observations, which will be taken up during summer in 2010.

Diversity of Spiders in Nanda Devi Biosphere Reserve, Uttarakhand



Funding source:

Department of Science and Technology,
Government of India

Investigators:

Dr. V.P. Uniyal and Dr. K. Sivakumar

Researcher:

Shazia Quasin

Date of initiation:

January 2008

Date of completion:

December 2011

Objectives: The objectives of the project are to: (i) document the species diversity of spiders in Nanda Devi Biosphere Reserve; and (ii) assess the diversity and distribution of spiders in different vegetation types along altitudinal gradients.

Progress: Representative sites with substantial altitudinal range were sampled following systematic quadrat plots. Six different collection techniques were employed, viz., pitfall trapping, vegetation beating, litter sampling, ground hand collection, aerial hand collection and sweep netting. To collect mainly the ground dwelling spiders, nine pitfall traps (cylindrical plastic bottles of 9 cm diameter and 11 cm depth) were arranged within the quadrats in three horizontal and three vertical rows, each at 5 m distance from the nearest neighbour, thus forming four smaller grids of 5 m×5 m within the sampling plot. Traps were filled with liquid preservative (69% water, 30% ethyl acetate and 1% detergent). Other methods were used to collect web builders, ambushers and ground runner spiders. Sampling was carried out along the altitude, from the base of Lata village (2000 m) to Lata Kharak (4100 m). This altitudinal range was further divided into 500 m zones, yielding four gradient classes that are (A) 2000-2500 m; (B) 2501-3000 m; (C) 3001-3500 m; and (D) 3501-4000 m. In each of these zones, ten 10 m×10 m quadrats were laid randomly. The spider samples were identified up to the family and generic levels. Voucher specimens were deposited at the Wildlife Institute of India, Dehra Dun.

Outputs and outcomes: A total of 791 individuals belonging to 17 families and 29 genera were collected during the sampling. The families Selenopidae, Clubionidae, Philodromidae, Agelenidae and Oxyopidae were recorded only from the lower altitudinal zone, 2000-2500 m. The

families Uloboridae and Miturgidae were recorded from the mid-altitudinal zone, 2501-3000 m, while the family Linyphiidae, although present in all the four zones, was most dominant in the high altitude zone, 3501-4000 m. The relative abundance of the family Linyphiidae was the maximum (21.8% of total abundance), followed by Lycosidae (14.91%), Araneidae (12.38%), Gnaphosidae (11.12%), Tetragnathidae (9.35%) and Thomisidae (8.09%). The families which accounted for the least relative abundance were Uloboridae (0.63%) and Pholicidae (0.37%). The densities of the families Araneidae ($0.025_{\text{mean}} \pm 0.01_{\text{SE}}$) and Linyphiidae ($0.04_{\text{mean}} \pm 0.01_{\text{SE}}$) were higher than those of the other families ($F=12.6$, $df=16$, 153 , $p<0.01$). The family richness at the sampling sites follows a linear, declining relationship with altitudinal gradient. Pearson's correlation indicated a strong negative relationship between the altitude and family richness ($r=-0.84$). Fifteen families were recorded from the lower zone, of which Lycosidae (16.37%) and Araneidae (15.67%) were dominant. The mid-lower zone and middle zone were represented by 13 and nine families, respectively, while only eight families were recorded in the higher altitudinal zone. The most dominant family in the high altitude zone was Linyphiidae. The Shannon-Weiner index estimated the family diversity at $1.07_{\text{mean}} \pm 0.01_{\text{SE}}$ in the low altitude zone and 0.72 ± 0.01 in the high altitude zone. Non-metric multidimensional scaling suggested that the high and lower altitudinal classes formed unique/non-overlapping homogenous family assemblages, while the mid-altitudinal zones had more heterogeneous family assemblages that overlapped with the two extreme elevation zones. The 17 families and 29 genera represent 28.3% and 7.8% of the families and genera recorded in India, respectively. The results suggest that family richness decreases with increasing altitude in Lata Kharak, Nanda Devi National Park.

Regional Rangeland Programme: Phase-III in India



Funding source :	ICIMOD, Kathmandu, Nepal
Nodal Officer :	Dr. G.S. Rawat
Co-investigator :	Dr. B.S. Adhikari
Researcher :	Dr. Amit Kotia
Date of initiation :	June 2008
Date of completion :	December 2011

Objectives: The objectives of the project are to: (i) develop and support a process for community-based management of rangeland resources in the Changthang plateau, eastern Ladakh; (ii) study the rangeland production system and recent changes in pastoral practices; and (iii) evolve a landscape level conservation plan for the rangeland resources and wildlife habitat.

Progress: The project is being implemented in the Changthang plateau of eastern Ladakh through the national partner, i.e., Department of Sheep Husbandry (DSH), Ladakh Autonomous Hill Development Council, Ladakh. During the reporting period, detailed meetings were held with the nomadic herders at Chusul, Hanley, Tso-moriri and Samad to form rangeland co-management committees. In four areas, women's self help groups (SHGs) were formed, and these groups have been given basic orientation on development of various products from pashmina and yak hair so as to generate more revenue for the groups. Extensive surveys were conducted to identify the suitable areas for

production of hay and silage in Durbuk, Kargyam and Hanley areas. In Phobrang area (northern parts of Pangong Tso) an area of about 10-15 ha was set aside for hay production in consultation with the herders, which appears to be successful. Baseline socio-economic studies on the herders were conducted in Hanley and Phobrang areas. Rapid surveys of rangelands in the northern and eastern parts of Changthang were conducted during summer in 2009, and information was collected on the extent of marsh meadows and their use by livestock as well as wild mammals.

Outputs and outcomes: Based on the above-mentioned surveys, a few areas have been identified for hay production and persons from poorer families have been employed to work in the hay plots. Baseline information has been generated on the livestock holding patterns and status of key rangelands.



Black-necked Crane: Amit Kotia

Monitoring Tigers in Ranthambhore Tiger Reserve Using Radio-Telemetry



Funding source:

NTCA, WII and Rajasthan Forest Department

Investigator:

Dr. Y.V. Jhala and Shri Qamar Qureshi

Researchers:

Peter Prem Chakravarthi J.

Date of initiation:

April 2009

Date of completion:

March 2012

Objectives: The project is aimed to: (i) monitor the source tiger population of Ranthambhore Tiger Reserve through an estimation of the tiger population in select areas of the reserve and survival and mortality rates of tigers using the capture-mark-recapture (CMR) framework; (ii) understand and monitor tiger dispersal patterns and land tenure systems; and (iii) keep a vigil on dispersing tigers so as to provide an update to the PA managers regarding their location for subsequent protection measures.

Progress: The project is continuation of ongoing work. Data on five radio-collared tigers (three males and two females) were collected to understand the home ranges, land tenure system and population demography of Ranthambhore tigers. Extensive surveys were carried out for carnivore signs across the RTR landscape to be followed up with intensive camera trapping to arrive at abundance indices for the tiger population.

Interestingly, a size reduction in the home range area of a radio-collared male tiger was observed (from 106.9 km² to 50.54 km²) following the appearance of a new territorial male, also a radio-collared male, in the area. Monitoring such territorial males with neighbouring or overlapping home ranges would reveal some interesting insights into land tenure systems in a high density tiger area. The dispersal of a sub-adult male fitted with a telemetry collar in

Jogeswar area of RTR was also monitored. The sub-adult male was a transient male which eventually started dispersing from its natal territory to establish its own territory. This sub-adult male moved to an adjacent area, stayed at Devpura Bandh for some time and settled at Qualji. The short-term home range of this sub-adult male after it settled down was 15.3 km². Along with two adult males and one sub-adult male, two adult females fitted with radio-transmitters were monitored. Both the females had relatively small home ranges, *i.e.*, 12.6 and 9.4 km². These tigresses occupied resource rich habitats with abundant prey and perennial water.

Between November to December 2009, camera pairs were deployed at 48 locations. Intensive photo capturing, 1392 trap nights over a 2 month period, resulted in 97 photo events of 28 unique individuals. A total of 25 tigers were repetitively captured during the entire session, proving the existence of a demographic as well as geographic close population (close test, $\chi^2=21.3$, $P=0.62$). Time-heterogeneity (Mth) was the appropriate model estimator for the population estimation in the CMR framework. The estimated tiger population in the sampled area was 32 ± 3 individuals (29-43 individuals, 95% CI) in an effective trapping area of 451.4 km². The current tiger density in RTR is estimated to be 7.04 (6.14-8.05) tigers per 100 km² using the $\frac{1}{2}$ MMDM method.

Population and Habitat Viability Assessment of Tiger Sub-populations in the North-western Terai-Arc Landscape



Funding source :

WWF-International

Nodal Officer :

Dr. S.P. Goyal

Researcher :

Abishek Harihar

Date of initiation :

January 2009

Date of completion :

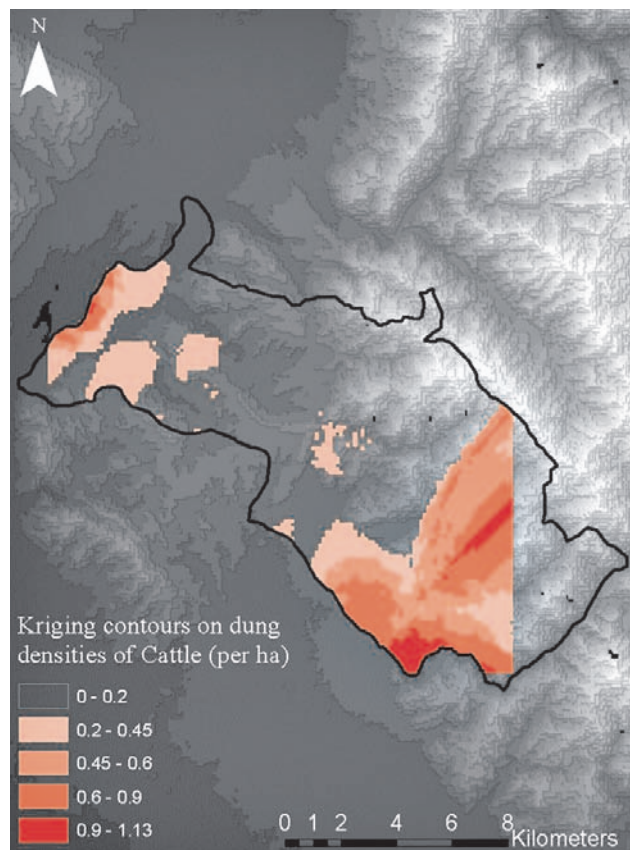
June 2010

Objectives: The objectives are: (i) to map the probability of prey species within a geographic information system (GIS) using occupancy models from pellet encounter data based on a hierarchical sampling design; (ii) to construct a spatially explicit tiger habitat model based on detection-non-detection data using landscape attributes and prey availability as explanatory variables; (iii) to estimate the population size of tigers using photographic capture-recapture sampling within the identified tiger use areas; and (iv) to model the viability of the sub-populations within the landscape under various management strategies.

Progress: Sign surveys were conducted over a total of 329 km in Tiger Habitat Block (THB) I and over 822 km in THB II following a grid-based sampling design, with each cell being 161 km² in area. During these surveys, the frequency of occurrence of predators and prey as well as signs of disturbance were recorded. Three camera-trapping grids were established to estimate the sizes of the sub-populations of tigers: (i) the Dhaulkhand and Kansrau tanges of western Rajaji National Park (RNP); (ii) the Chilla and Ghouri ranges of eastern RNP; and (iii) the Kotri and Naudi ranges of Lansdowne Forest Division.

Outputs and outcomes: The sign surveys conducted in THB I (~1800 km²) found that only 7% of the sampled trails was used by tigers, with the presence of two individual tigers confirmed (both females, confirmed by camera trapping). In THB II (~300 km²), tiger signs were recorded in 70% of the sampled trails. In particular, high use of the Lansdowne Forest Division (Rajaji-Corbett corridor) by tigers was documented. The sign surveys documented a relatively low wild prey occurrence outside protected areas. Camera trapping in eastern RNP revealed the use of the area by 8 individual tigers within an area of ~200 km². Using the

information that was generated so far, it is hoped to generate well-stratified data on predators, prey and disturbance levels from outside protected areas. This has been accomplished in the Chilla Range of RNP, and analysis is under way for the rest of the landscape.



Kriging contours depicting areas of livestock mediated competition within Chilla Range of Rajaji National Park

Conservation of the Endangered Asiatic Wild Dog, *Cuon alpinus* in Western Arunachal Pradesh: Linking Ecology, Ethnics, and Economics to Foster to Better Coexistence



Funding source:

Department of Science and Technology,
Govt. of India

Investigators:

Shri Gopi G.V. and Dr. Bilal Habib

Researchers:

Salvador Lyngdoh and K. Muthamizh Selvan

Date of initiation:

May 2009

Date of completion:

May 2012

Objectives: The objectives of the project are to: (i) estimate the abundance and population structure of the dhole and its prey species in the protected areas of western Arunachal Pradesh; (ii) examine the predation patterns of the dhole packs on the different prey species; and (iii) quantify the current people-wild dog conflicts by assessing the livestock depredation by dholes and retaliatory killing by local people.

Progress: Pakke Tiger Reserve, in western Arunachal Pradesh, was extensively surveyed. The area was mapped into grids for systematic sampling using camera traps to estimate the relative abundances of the wild dog and other sympatric carnivores using 25 pairs of remotely triggered camera trapping stations. The food habits of these species were analysed through scat collection. During the interim period, nearly 250 scats, comprising 95 wild dog scats, 50 tiger scats and 70 leopard scats, were collected and processed for further analysis. Habitat variables such as vegetation density, abundance, dominance and other co-variables were systematically recorded for further in-depth analysis. Also, prey availability and detection data were collected by walking 18 line transects that were repeated three times in different habitats inside the reserve.

A set of open ended questions were prepared to assess livestock depredation, retaliatory killing, local views, attitudes, occupation, awareness levels, education, health status, hunting practices, agricultural practices and livestock population. The target group was mainly villages located around mature forests that could hold a good prey population and also provide for the daily needs of the local people. Local hunters and village headman were interviewed for valuable information. Target indigenous communities were the Nishi and Apatani people of western Arunachal Pradesh. Around 45 villages were sampled

across three districts, i.e., East Kameng, Papumpare and Lower Subansiri. Around 400 households were interviewed.

Areas around Pakke Kesang and Seppa adjacent to the Pakke Tiger Reserve and the Apatani Valley adjacent to the Talley Valley Wildlife Sanctuary have a high degree of conflict relating to livestock depredation by the wild dog and retaliatory persecution by locals. Data collected during the past year are being computerized and analysed.

Output and outcomes: Preliminary findings of the food habits study suggest that the wild pig forms the major prey, followed by the sambar, barking deer and gaur. The overall encounter rate was high for the gaur ($0.22/\text{km}^2$), followed by the wild boar ($0.16/\text{km}^2$), sambar ($0.15/\text{km}^2$) and barking deer ($0.14/\text{km}^2$), and the lowest encounter rate found was that of the langur ($0.08/\text{km}^2$). The total prey biomass was estimated to be $2792 \text{ kg}/\text{km}^2$. The gaur and sambar contribute the greatest biomass though the density is comparatively lower than those of other prey species, followed by the wild boar, barking deer and langur.

High depredation rates were reported from the Pakke Kesang and Seppa region (near Pakke Tiger reserve) and Segalee (near Itanagar Wildlife Sanctuary) and in Apatani valley (near Talle Valley Wildlife Sanctuary). Most of the hunting activities were carried out during winter and early summer. Most of the hunting activity was for the consumption of wild meat. Sale was the second most common reason for hunting along with local consumption. It was found that retaliatory killing due to livestock depredation is a major threat to the wild dog population. Intensive camera trapping, a food habit study and investigation of the driving factors of hunting, hunting frequency and conflict assessment are proposed for 2010-2011.

Monitoring of re-introduced tigers in Sariska Tiger Reserve, Rajasthan

**Funding source :**

Government of Rajasthan and National Tiger Conservation Authority (NTCA), New Delhi

Investigator :

Dr. K. Sankar

Researcher :

Subhadeep Bhattacharjee

Date of initiation :

February 2009

Date of completion :

February 2012

Objectives: The objectives of the projects are to: (i) collect information on the ranging, movement, home ranges of the reintroduced tigers and their dispersal pattern; (ii) collect information on the habitat use by the reintroduced tigers; (iii) gather information on the food habits of the reintroduced tigers; (iv) assess the population of the prey species; (v) prepare a habitat suitability map for the tiger and its prey species; (vi) assess the effect of anthropogenic pressure on the distribution of the tigers; (vii) evaluate the response of the tigers and their prey species with reference to the removal of anthropogenic influences from the relocated villages; and (viii) suggest management recommendations for effective conservation of tigers in the tiger reserve.

Progress: All the three reintroduced tigers (a male and two females) were monitored periodically through ground tracking using the homing in and triangulation techniques. The minimum convex polygon (MCP) technique was used for home range calculation. The prey species abundance in the study area was estimated by the line transect method. In total, 32 line transects (60.4 km) were laid in tiger occupied habitats. The transects were walked three times in the early morning, resulting in a total effort of 181.2 km. On each sighting of potential prey species on line transects, the total number of individuals, sighting angle and angular sighting distance were recorded. The DISTANCE 5 program was used to estimate the density of prey species. The tree layer, shrub layer, ground cover, canopy cover, weed abundance, pellet abundance and anthropogenic pressure (wood cutting/lopping) were quantified along the line transects at every 200 m sampling point. A total of 88 tiger scats were collected to study the food habits. All the scats were washed, oven dried and subsequently preserved for future analysis. The micro-histological structures of hairs were used to identify the prey species. Tiger kills were also recorded. In total 489, 488 and 594 radio locations were recorded, respectively, using a hand-held global positioning system (GPS) for the tiger, tigress-1 and tigress-2. These positions

were later transferred onto the Sariska beat map for home range estimation. Twenty pairs of camera traps were deployed in two large sampling areas, each of 80 km² extent, to obtain information on the co-existence of other large carnivore species such as the leopard and striped hyena with the reintroduced tigers. Camera trapping was done in this block for a period of 60 days.

Outputs and outcomes: The average monthly areas of utilization of these three tigers were 110 km², 60 km² and 55 km², respectively, for the tiger, tigress-1 and tigress-2. The estimated annual home ranges of these tigers were 168.6 km², 181.4 km² and 223.4 km², respectively. The large home range sizes were attributed to their initial habitat exploration after reintroduction. It was found that gradually all the three tigers were settled in the best available habitats in Sariska. The tiger's home range completely covered the home ranges of both the tigresses. The individual prey densities and mean group size were estimated for all prey species. The study area was found to harbour a high ungulate density of 107.8 animals/km². The total prey density excluding peafowl was estimated to be 190.5 animals/km². The density of peafowl was the highest amongst all the prey species (125.2±15.3/km²), followed by livestock (buffalo and cattle) (59.9±22.3/km²), chital (46.7±9.5/km²), sambar (26.2±4.9/km²), common langur (22.8±6.5/km²), nilgai (19.5±3.3/km²) and wild pig (15.4±4.4/km²). The total ungulate biomass was estimated to be 10,072.8 kg/km². The estimated total biomass of all the potential prey species, including livestock and peafowl, was 21,618.1 kg/km². Analysis of tiger scats revealed that the sambar was the preferred prey, followed by the chital, livestock, nilgai, and common langur. Examination of 96 tiger kills revealed that the sambar was the most utilized prey species (48%), followed by the chital, livestock, nilgai, wild pig and common langur.

Assessment of Banj Oak Forests and Their Conservation Status in Uttarakhand



Funding source :

Uttarakhand State Council for Science & Technology

Investigator :

Dr. G.S. Rawat

Researcher :

Dr. Gajendra Singh

Date of initiation :

June 2009

Date of completion :

December 2010

Objectives: The objectives of the project are to: (i) generate base maps showing the distribution of the Banj oak (*Quercus leucotrichophora*) forests in the of Uttarakhand; (ii) assess the status of oak forests in various districts; (iii) mark the zones of transition between oak and pine forests; and (iv) evolve conservation and management strategies for the oak forests.

Progress: In order to generate the base maps showing the distribution of Banj oak (*Quercus leucotrichophora*) forests in the of Uttarakhand, four scenes of the IRS P6 LISS III and one scene of AWiFS data were procured from the National Remote Sensing Agency (NRSA) Hyderabad. Both supervised and unsupervised classification was used for the delineation of major forest types including oak forests within the elevation zone of 1000-2500 m asl (zone of Banj oak). Forest working plans for various divisions were consulted to obtain information on the oak forests and past working in this zone. Fieldwork to assess the current anthropogenic pressures and regeneration status and to verify the ground truth of crude maps showing oak forests is in progress. A total of six broad vegetation types have been delineated within the elevation range 1000-2500 m. These include Banj oak forests, pine forests, sub-tropical scrub

forests, temperate conifer (mixed) forests, broad leaved mixed forests and non-forest lands including grasslands, fallow fields and cultivation. According to the forestry working plans (Uttarakhand Forest Department), the area under Banj (oak) forest in the state is 3830.88 km², i.e., 15.69% of the total forest area. Miscellaneous/mixed forests contribute the maximum forest area (25.17%), followed by chir pine forests (16.15%). Perusal of the information contained in the working plans reveals that most of the oak forests are heavily used by the local communities for leaf fodder and fuelwood and that there is very poor regeneration of Banj oak in most of the reserved forests. However, no concrete steps have been initiated so far for ecological restoration of degraded forests. Data on the regeneration status of oak species have been analysed for the Mandal area of Chamoli district. In this area Banj oak forests are closer to the village fringes in the north-east-to-east direction at an altitude from 1500 to 2200 m with a low canopy cover (15-25%). It was seen that the regeneration of Banj oak is better in only a few patches at the lower elevation. Most of the areas with open canopy have been totally covered by an alien invasive species, *Eupatorium adenophorum*. It also appears that this species is gradually shifting towards higher elevations. Some of the individuals of *Eupatorium adenophorum* were recorded around 2600 m. The areas recently invaded by chir pine and *Eupatorium* in different places have been marked on the maps using a GPS.



Gajendra Singh

Outputs and outcomes: The ground truth verification of various categories of oak forests in Garhwal region has been completed. Preliminary observations on the regeneration status of forests and anthropogenic pressures have been made. The major output expected is a status report on the oak forests in the state giving recommendations for their conservation and management.

Monitoring Source Population of Tiger in Kanha Tiger Reserve



Funding source:

National Tiger Conservation Authority (NTCA), New Delhi

Investigators:

Dr. Y.V. Jhala and Shri Qamar Qureshi

Researcher:

Ujjwal Kumar

Date of initiation:

June 2009

Date of completion:

June 2012

Objectives: The objectives of the project are to: (i) monitor the source population of tigers in Kanha Tiger Reserve and address (a) tiger population estimates within select areas of the reserve and (b) survival and mortality information through a mark-recapture study; (ii) monitor the prey, co-predator populations and habitat condition in the tiger reserve; and (iii) gain an understanding of tiger dispersal patterns.

Progress: Permission to radio-collar eight tigers has been sought from the Chief Wildlife Warden, M.P., and is awaited. The camera locations were selected to maximize the chances of capturing the tigers within each cell of the grid. They were selected on the basis of the presence of tiger signs such as scats, pugmarks, scrapes, rake marks and scent marks. A line transect survey based on visual detection of animals is the preferred formal population estimation method.

A reconnaissance survey was carried out and an area of 250 km² was identified for camera trapping. In this area 58

camera trap stations were selected. Each station was in a 5 km² grid. Data collection, entry and analysis are in progress.

Blood samples from radio-collared tigers and tiger scat samples from the landscape connecting Kanha Tiger Reserve with Pench, Bandhavgarh and Achanakmar are being collected and analysed using nuclear DNA microsatellite markers to understand the meta-population structure and gene flow. Field collected carnivore scats were confirmed as originating from tigers based on PCR amplification and restriction enzyme digestion of the mitochondrial DNA cytochrome *b* gene. Twelve microsatellite markers (initially tested for polymorphism levels on radio-collared individuals and selected scats) are now being used to identify individual tigers from scats. Attempts are being made to answer important conservation questions of the effects of habitat fragmentation, landscape patterns that are barriers to gene flow, times of isolation and the rate of genetic exchange between sources.



Population Estimation and Ecology of the Tiger in Sunderban Tiger Reserve, West Bengal



Funding source :

National Tiger Conservation Authority (NTCA), New Delhi

Investigators :

Dr. Y.V. Jhala and Shri Qamar Qureshi

Researchers :

Dipanjan Naha and Manjari Roy

Date of initiation :

October 2009

Date of completion :

October 2012

Objectives: The objectives of the project are to: (i) develop a methodology for monitoring tigers, co-predators and their prey in the mangrove swamps; (ii) estimate the tiger population and density; (iii) assess the population and density of prey species; (iv) assess the home range of tigers; and (v) suggest management recommendations for effective conservation of tigers in the tiger reserve.

Progress: For estimating the density of signs and for detecting trends in the tiger population, channel surveys were designed and conducted. In each 100 km² block, 20 km of channel was surveyed during the low tide by boats. All signs of tigers, lesser cats, estuarine crocodiles and ungulates were recorded. GPS coordinates were recorded for each sign along with habitat characteristics such as the type of mangrove, slope of bank and width of channel.

Channels of a minimum length of 15 km were identified in each forest block for conducting boat transects for estimation of the prey density based on visual detection of animals. In the Sundarbans, animals were seen to be more active during low tides and thus boat transects were carried

out accordingly using distance sampling. Each boat transect was repeated a minimum of three times and a maximum of six times. For each cluster of animals seen on the banks, the following variables were recorded: (i) species; (ii) cluster size; and (iii) perpendicular distance of the animal.

Of the eight tigers to be radio-collared, two have been collared with satellite collars. The satellite collars will provide vital information on the tigers, including sign deposition rate, sign decay rate, ranging pattern of tigers, home range of tigers and information relating to the ecology of the tiger in this unique mangrove ecosystem. The collared tigers were tracked through the conventional VHF technique, apart from satellite tracking to obtain field level data.

During channel surveys, pugmarks less than 24 hours old were identified and marked. These pugmark sets were monitored regularly to evaluate the decay rate. The sign deposition rate will be interpreted as the number of creeks/channels crossed by the radio-collared tigers per day.



Manjari Roy

Monitoring Source Population of Tiger in Corbett Tiger Reserve



Funding source :

National Tiger Conservation Authority (NTCA), New Delhi

Investigators :

Dr. Y.V. Jhala and Shri Qamar Qureshi

Researcher :

Shikha Bisht

Date of initiation :

October 2009

Date of completion :

October 2012

Objectives: The objectives of the project are to: (i) evaluate the tiger population and density estimation; (ii) assess the population and density of prey species; (iii) assess the home ranges of tigers; (iv) study the interaction among different individuals of adjacent territories; and (v) suggest management recommendations for effective conservation of tigers in the tiger reserve.

Progress: The project objectives aim to implement Phase IV at Corbett Tiger Reserve so as to monitor this important source population of tigers intensively in the Terai-Shivalik landscape on a regular basis.

As only part funding for the project proposal has been sanctioned, studying the dispersal and ranging patterns using telemetry will be initiated at a later date. The “Monitoring System for Tigers—Intensive Patrolling and Ecological Status” (MSTrIPES) is proposed to be implemented in Corbett Tiger Reserve as a part of this project. The methodology and data collection towards this end were designed and commenced.

The methodology evolved for the assessment and monitoring of tigers, co-predators, prey and their habitat was followed. The first phase consisted of an extensive survey of all forest patches for carnivore signs, wild ungulate presence and abundance index, and habitat parameters including indexing anthropogenic pressures. The third phase addresses the issue of estimating the number of tigers and their prey.

The camera locations were selected to maximize the chances of capturing the tigers within each cell of the grid. They were selected on the basis of presence of tiger signs such as scats, pugmarks, scrapes, rake marks and scent marks. A line transect survey based on visual detection of animals is the preferred formal population estimation method.

A reconnaissance survey was carried out, and an area of 215 km² was identified for camera trapping. In this area 57 camera trap stations were selected. Each station was in a 5 km² grid. Data collection, entry and analysis are in progress.

The 29th Indian Scientific Expedition to Antarctica: Long-Term Monitoring of Wildlife and Their Habitats in Antarctica

Funding sources:	National Centre for Antarctic and Ocean Research (NCAOR), Ministry of Earth Sciences, Government of India and Wildlife Institute of India
Investigators:	Dr. J.A. Johnson and Shri R. Suresh Kumar
Date of initiation:	November 2009
Date of completion:	March 2010

Objectives: This long-term wildlife monitoring programme is aimed to: (i) determine the status of identified indicator fauna (whales, seals, penguins and other birds) in the Southern Indian Ocean (along the sea journey) and in the Larsemann Hills and Maitri regions of Antarctica; (ii) conduct wildlife surveys along the coast of Larsemann Hills to identify areas with high wildlife value and along the Princess Astrid Coast (5-20°E, 69-72°N) to assess changes in the status of penguins and seals; and (iii) evaluate and map the wildlife habitats and identify threats to the wildlife and habitats.

Progress: The expedition began on November 30, 2009 from Cape Town, South Africa, heading first to the Larsemann Hills site. Monitoring for oceanic birds and other wildlife was carried out during December 1-12, 2009 en route from onboard the expedition vessel, *Ivan Papanin*. A total of 30 species of oceanic bird (including two species of penguin), two species of whale and two species of seal were recorded. A gradual change in the bird species assemblage along the sea route was observed. Notable bird species recorded during the voyage were six species of albatross, two species of giant petrel, 10 species of smaller petrel, two species of skua, southern fulmar *Flumarus glacialisoides*, Salvin's prion *Pachyptila salvini*, Antarctica prion *P. desolata*, Arctic tern *Sterna paradisaea*, emperor penguin *Aptendoytes forsteri* and Adelie penguin *Pygoscelis adeliae*.

At Larsemann Hills, five aerial surveys were carried out, covering an overall distance of 950 km. The five aerial sorties, each spanning close to 2 hours, were made using an AS 350 B2 helicopter, covering over 200 km of the coastline of the Larsemann Hills region, starting from close to the Vestfold Hills in the south to the beginning of the Amery Ice Shelf in the north. Sorties were flown along the ice shelf, next over fast ice and then along the pack ice to compare seal distributions and abundance. The Weddel seal *Leptonychotes weddellii* was the most commonly recorded species. A total of

1,350 seals were counted during December at an encounter rate of 2.7 seals/km. Along the same survey route in January, 1900 seals were counted at an encounter rate of 6.1 seals/km. Two very large penguin rookeries, one of the emperor penguin (numbering 5000+ birds) and Adelie penguin (numbering 3000+ birds) were observed in the eastern part of the Larsemann Hills. Foot surveys were also made in and around Bharti Station, and observations of the south polar skua *Catharacta maccormicki*, Wilson's storm-petrel *Oceanites oceanicus* and snow petrel *Pagodroma nivea* were made.

During the voyage from Larsemann hills to India Bay, killer whale *Orcinus orca* was the species most often sighted. Other whales indentified were the Antarctic minke whale *Balaenoptera bonaerensis*, humpback whale *Megaptera novaeangliae*, sperm whale *Physeter macrocephalus* and southern bottlenose whale *Hyperoodon planifrons*. At India Bay, two aerial surveys covering a total distance of 330 km were carried out to count seals and penguins. Here again, the Weddel seal was the highest recorded species, with a total of 306 at an encounter rate of 0.7 seals/km, though this was markedly less than that recorded at the Larsemann Hills site. However, a large number of crabeater seals *Lobodon carcinophaga* were recorded at India Bay, with 62 records at an encounter rate of 0.2 seals/km. Sightings of a single leopard seal *Hydrurga leptonyx* and a pair of Ross seals *Ommatophoca rossii* were also made at India Bay. Further, during the aerial surveys here, 275 Adelie penguins and 133 emperor penguins were counted.

Output and outcomes: During this expedition, survey routes and tracks were marked using the GPS. These routes and tracks form a benchmark and will be used for any future monitoring of the seal and penguin populations in the region.

Wildlife Crime Scenario in India: A Perspective Based on Wildlife Offence Cases Referred to Wildlife Institute of India



Funding source:

TRAFFIC-India

Investigators:

Dr. S.P. Goyal, Shri Samir Sinha and Shri Khalid Pasha

Researcher:

Malay Shukla

Date of initiation:

November 2009

Date of completion:

September 2010

Objectives: The project is aimed at: (i) understanding the nature and extent of trade in wildlife prevailing across various states of India, evaluation of the documentation related to wildlife offences referred to WII and the requirements of FIR/POR/Search Memo/Seizure memo, etc. for legal proceedings and understanding the importance of the chain of custody and the sample seal; (ii) preparing handy charts for evaluation of wildlife crime scenes; (iii) analysis of different issues related to wildlife offences for better understanding offence cases from different states of India and comparing information across states; and (iv) preparation of handy protocols for collection of samples during wildlife offence cases and circulating the same to forest departments, police departments, courts and other case forwarding authorities.

Progress: Over 200 wildlife offence cases referred to WII were taken for preliminary examination and the documentation of different cases was studied. Based on the observations of wildlife offence cases, a few inferences were made regarding the need for documentation in wildlife offence cases. Data entry of wildlife offence related material was started. Loopholes or drawbacks in documentation of wildlife crime cases were sorted based on data entry of wildlife crime. Handy charts were prepared for the documentation of wildlife offence cases. It is necessary to have complete documentation to file wildlife offence case, crimes detected, modus operandi of crimes, seized materials/evidence and the family background of the suspect.

Scientific research is required to develop: (i) genetic and other species-specific data banks for assessing and confirming test results in forensic circumstances and (ii) testing and analysis techniques that are not only

scientifically rigorous but also easy to use, easy to interpret, flexible, widely available and cost-effective. The study was undertaken initially for Madhya Pradesh, Uttar Pradesh and Uttarakhand. Twenty percent of wildlife offence cases had a FIR/POR in the documentation, a specimen/sample seal was present in 33% of cases, photography/videography of the crime scene was documented in 45% of the cases, and a panchnama was present in only 2% of the cases.

Outputs and outcomes: A database of wildlife offence cases would help us to develop protocols for rapid processing of wildlife offences. The work identified several key challenges in the pursuit of more effective and efficient application of wildlife forensic techniques. These fall broadly into three overlapping categories that address, in turn, scientific investigation; application and implementation; and governance arrangements. Law enforcement agencies should be made aware of the importance of the FIR/POR, seal of sample/evidence, maintaining a chain of custody, etc. and trained properly to collect wildlife crime evidence and document a wildlife offence in systematic way. Lack of reference samples is one of the reasons for delays in responding to enforcement agencies. A proper data bank of wildlife reference samples should be made available from forest departments.

Macroecology of the Terrestrial Herpetofauna in Andaman and Nicobar Archipelago

**Funding sources:**

DST, Programme Appraisal Committee—
Animal Sciences, New Delhi

Investigators:

Dr. Karthikeyan Vasudevan, Shri B.C.
Choudhury (WII), Dr. S.K. Dutta (North
Orissa University, Orissa) and Dr. Indraneil
Das (University of Malaysia)

Researchers:

S. Harikrishnan and S.R. Chandramouli

Date of initiation:

January 2010

Date of completion:

January 2014

Objectives: The objectives of the project are to: (i) identify the factors which influence the spatial patterns in species abundance and distribution of reptiles and amphibians in islands; (ii) test null models in the community structure of insular reptiles and amphibians; and (iii) identify the factors which influence the community structure of reptiles and amphibians in islands.

Progress: A review of the herpetofaunal diversity in the Andaman and Nicobar Islands was made through a literature survey. The available data on the body sizes of reptiles were compiled. Methods for sampling were discussed and formalized. It was decided that the survey would start in the Andamans and that in the second year it would be focussed on the Nicobars. Preparations for the field visit were also made.

Outputs and outcomes: The review of the literature revealed that there were 40 species of reptile and eight species of amphibian are reported from the Andaman Islands. Similarly, 47 species of reptile and 10 species of amphibian are reported from the Nicobar Islands alone. There are very few large islands, whereas there are many small and very small islands.

Milestone: The preliminary data analysis suggests that the islands in the Andamans have been poorly surveyed for herpetofaunal diversity. There could be many new records and range extensions coming from this study.



Cantor's Pit Viper: S. Harikrishnan

Ecological Monitoring of Tiger Population in Panna Landscape, Madhya Pradesh



Funding source:

Madhya Pradesh Forest Department

Investigator:

Dr. K. Ramesh, Mr. S. Sen, Dr. J.A. Johnson (WII) and Field Director, Panna Tiger Reserve

Researchers:

Ravi N. Parmar and Devi Priyadarshini

Date of initiation:

February 2010

Date of completion:

January 2014

Objectives: The objectives of the project are to: (i) monitor and study the population growth of the translocated/reestablished tiger population in Panna Tiger Reserve (TR); (ii) understand the dynamics of co-predator and prey populations in relation to tiger occupancy patterns and other management interventions; and (iii) study the landscape ecology of the tiger, incorporating human interface issues and ecological correlates linked to economics and system services.

Progress: Following the extinction of the tiger in Panna TR, a reintroduction process for re-establishing the tiger population in this reserve began in March 2009 with the translocation of a female tiger from Bandhavgarh TR and another female tiger from Kanha TR. Subsequently, in November 2009, a male was translocated from Pench TR. These animals were radio-collared, the females with VHF/GPS collars and the male with a VHF/GPS satellite

collar, and monitored based on the home-in and triangulation methods. Grid based sampling was adopted for estimating the population status of large carnivores and prey species using camera traps and the line transect method, respectively. A hierarchical spatial framework was described to target the landscape ecology of the tiger in Panna landscape taking into consideration the patch properties and connectivity.

Outputs and outcomes: The research fellows were trained in research methodology, and a reconnaissance was carried out in the field. Meanwhile, the female tiger translocated from Bandhavgarh TR produced a litter of four cubs, marking the beginning of successful reintroduction efforts in Panna TR specifically and India in general.



Ravi Parmar

Development of Appropriate Techniques for Minimizing Man-Animal Conflicts



Funding sources:

Investigator:

Researcher:

Date of initiation:

Date of completion:

Gujarat Forest Department

Dr. N.P.S. Chauhan

Devender Kumar Thakur

August 2009

October 2010

Objectives: The project has the following objectives: (i) to identify and study the species- and site-specific wildlife damage problems, extent and severity of damage in and around select protected areas/managed forests in Gujarat state; (ii) to help in the procurement and fabrication of equipment, nets, traps, etc. required for mitigation of conflict; (iii) to evaluate the control methods in practice and formulate appropriate mitigation strategies that will be effective technically and cost-wise; and (iv) to establish a database on wildlife damage problems and their control and help in providing animal damage control (ADC) extension and education packages for dissemination to people in the affected areas.

Progress: The project work was initiated in August 2009. To begin with, the principal investigator, along with one researcher, visited Gandhinagar and select field areas in Gujarat during June-July 2009. Discussions were held with the Chief Wildlife Warden (CWLW), Chief Conservator of Forests (Research) and other forest officials regarding problem species and conducting fieldwork in the affected areas in Gujarat.

Surveys are being conducted in Vadodara, Surat and Valsad circles, covering Vadodara, Dahod, Panchmahal, Narmada, Tapi, Valsad and Dang districts. Information from the various affected forest divisions of Chotta Udaipur, Baria, Godra, Rajpipla (East), Rajpipla (West), Vyara, Valsad (North), Valsad (South), Dang (North), and Dang (South) is being collected. Information is also being collected from in and around Jessore Wildlife Sanctuary, Banaskantha; Purna Wildlife Sanctuary, Dangs; Jambughoda Wildlife Sanctuary, Panchmahal district; and Ratanmahal Sloth Bear Sanctuary, Dahod district.

Villages located in and around protected areas and forest divisions in Vadodara, Dahod, Panchmahal, Armada,

Valsad and Dang districts are mainly growing tuar, urad, moong, maize, jowar and bajra. Sugarcane and banana are grown only in south Gujarat, i.e., Narmada, Tapi, Navsari, Dang and Valsad districts. Damage to these agricultural crops is mainly caused by the nilgai and sloth bear. Wild pigs and deer species are also responsible for crop damage in some pockets.

In Godra Forest Division, a reconnaissance survey was conducted in and around Jamughoda Wildlife Sanctuary, covering the following villages: Kada dam, Laphne dam, Gundi beri, Dhanpuri, Kewa and Malbar. Information on human casualties caused by the leopard and sloth bear and crop damage by wild animals has been collected. The leopard preyed on livestock, mainly goats. Crop damage by the nilgai was 5-25%; the maximum damage was recorded on tuar, maize, jowar, bajra, moong and gram. The langur and pangolin were also responsible for crop damage. In and around Chota Udaipur Forest Division and Baria Forest Division, occasional cases of human-sloth bear conflict have been reported. Besides the sloth bear, wild pigs are also responsible for crop damage.

Human-leopard conflict has been reported from many protected areas and forest divisions in Gujarat. Although cases of leopard attacks were more numerous, the sloth bear remained the most dreaded animal among all. Livestock form the second most important component of the traditional subsistence economy in Gujarat. Agricultural crop damage by locally over-abundant wildlife populations has been widely reported from many parts of the country. In Gujarat, the total estimated number of nilgai is 97,004. The districts most affected by crop depredation by nilgai were Amreli, Banaskantha, Kutch, Patan and Rajkot, whereas in the rest of the districts, the crop damage problem was recorded at being at a low to medium level.



V.P. Uniyal

academic & training

XII M.Sc. in Wildlife Science

Status of Doctoral Research

XXX PG Diploma Course

XXXI PG Diploma Course

XXV Certificate Course

Other Training Courses

XII M. Sc. (Wildlife Science), July 2009 to July 2011

The XII M.Sc. (Wildlife Science) course in wildlife science commenced from June 26, 2009, for a duration of two years, with 11 students from different states (nine Indians and one foreign national each from Nepal and Mongolia). The candidates were selected through NET on merit basis. Eight students were awarded WII fellowships, and three students were self-sponsored.

The students were taken to Rajaji National Park (Dholkhand) for their orientation-cum-study tour during July 19-25, 2009. The students were taken to Sariska Tiger Reserve during October 18-31, 2009 for a techniques tour to train them in different wildlife techniques and to provide knowledge regarding the identification of flora and fauna.

Semester II started from December 29, 2009. As per the course schedule, a specialized tour on wetland conservation was conducted. The students were taken to Bhitarkanika Wildlife Sanctuary and National Park, Gahirmatha Marine Sanctuary, Nalabana Wildlife (Bird) Sanctuary, Chilika New Mouth and Rushikuliya, in Orissa, from February 23 to March 6, 2010.

Dissertations Supervised

Bagache, Pushkal (2009): **Evaluation the status of leopards in Parambikulam Tiger Reserve, Kerela.** Forest Research Institute, Dehra Dun. Supervisor: Dr. Y.V. Jhala.

Bisht, S. (2009): **Status and distribution of ungulates and galliformes in Prek Chu catchment of the Khangchendzonga Biosphere Reserve, Sikkim.** Forest Research Institute University, Dehra Dun. Supervisor: Dr. S. Sathyakumar.

Datta, S.B. (2009): **Nutritional ecology of Asian elephants (*Elephas maximus*) in Chilla Range of Rajaji National Park, Uttarakhand.** Saurashtra University, Rajkot, Gujarat. Supervisors: Dr. S.P. Goyal and Dr. S. Sathyakumar.

Dohling, L.M. (2009): **Status, distribution and relative abundance of galliformes in Nongkhyllam Wildlife Sanctuary, Meghalaya.** Forest Research Institute University,

Dehra Dun, Uttarakhand. Supervisor: Dr. S. Sathyakumar.

Ghosh, Arka Pratap (2009): **Occupancy, abundance and habitat suitability of wild herbivores in Mudumalai Tiger Reserve, Tamil Nadu.** Forest Research Institute University, Dehra Dun. Supervisor: Dr. K. Sankar.

Ghuman, Sartaj (2009): **A study of vigilance behaviour of chital (*Axis axis*) in Pench Tiger Reserve, Madhya Pradesh.** Wildlife Institute of India (Saurashtra University), Dehra Dun. Supervisors: Dr. K. Sankar and Dr. Y.V. Jhala.

Gupta, P. (2009): **Attitudes of local people towards forest and tiger conservation in Kanha Tiger Reserve.** Forest Research Institute University, Dehra Dun. Supervisor: Dr. R. Badola.

Kalle, Riddhika (2009): **Estimation of tiger and leopard abundance in Mudumalai Tiger Reserve, Tamil Nadu.** A.V.C. College, Tamil Nadu. Supervisor: Dr. K. Sankar.

Kesiezie, K. (2009): **Status, distribution and relative abundance of galliformes in Khonoma Nature Conservation and Tragopan Sanctuary, Nagaland.** Forest Research Institute University, Dehra Dun. Supervisor: Dr. S. Sathyakumar.

Kidwai, Zara (2009): **Population and habitat use of galliformes in Sariska Tiger Reserve, Rajasthan.** Aligarh Muslim University, Aligarh. Supervisor: Dr. K. Sankar.

Mainak, M. (2009): **A review of scenario and possibilities of clean development mechanism in India.** Forest Research Institute University, Dehra Dun. Supervisor: Dr. R. Badola.

Malla, Sabita (2009): **Estimating the status and impact of hunting on tiger prey in Bardia National Park, Nepal.** Wildlife Institute of India (Saurashtra University), Dehra Dun. Supervisor: Dr. Y.V. Jhala.

Monika Kumari (2009): **Infestation of woody parasitic epiphytes in a part of Kedarnath Forest Division.** Forest Research Institute University, Dehra Dun. Supervisor: Dr. B.S. Adhikari.

Naha, Dipanjan (2009): **Evaluation the status of tigers in**

Parambikulam Tiger Reserve, Kerela. Forest Research Institute, Dehra Dun. Supervisor: Dr. Y.V. Jhala.

Nandi, Amrita (2009): **Identification of common Indian cervid, sambar (*Cervus unicolor*) using RAPD and RFLP Techniques.** HNB University, Garhwal Srinagar. Supervisors: Dr. S.K. Gupta and Dr. S.P. Goyal.

Passeport, F. (2009): **Appropriation of natural resources, space and discourses of the Bhotiya community of Mana village (buffer zone of Nanda Devi Biosphere Reserve), Uttarakhand, India.** Environmental Anthropology, Muséum National d'Histoire Naturelle (Paris, France). Supervisor: Dr. R. Badola.

Roy, M. (2009): **Status and distribution of carnivores in Prek Chu catchment of the Khangchendzonga Biosphere Reserve, Sikkim.** Forest Research Institute University, Dehra Dun. Supervisor: Dr. S. Sathyakumar.

Singh, H. (2009): **Urban attitudes towards climate change in Dehra Dun.** Forest Research Institute University, Dehra Dun. Supervisor: Dr. R. Badola.

Solenki, Riddhima (2009): **Landscape characterization and evaluation of vegetation change in Mudumalai Tiger Reserve, Tamil Nadu.** Forest Research Institute University, Dehra Dun. Supervisor: Dr. K. Sankar.

Status of Doctoral Research in WII

Degrees Awarded

Advait Edgaonkar (2009): **Ecology of the leopard in Satpura National Park and Bori Wildlife Sanctuary.** University of Florida. Supervisor: Dr. Melvin Sunquist. Co-supervisor: Dr. Ravi Chellam.

Ambica Paliwal (2009): **Geospatial modelling of ungulate-habitat relationship in Tadoba-Andhari Tiger Reserve.** Saurashtra University. Supervisor: Dr. V.B. Mathur.

Anil Kumar Bhardwaj (2009): **An assessment of ecodevelopment initiatives in Periyar Tiger Reserve.** Forest Research Institute University, Dehra Dun. Supervisor: Dr. Ruchi Badola.

Chitaranjan Dave (2010): **Ecology of chital (*Axis axis*) in Gir.** Saurashtra University. Supervisor: Dr. Y.V. Jhala.

Dhananjai Mohan (2009): **Habitat selection of birds in New Forest, Dehra Dun, India.** Forest Research Institute University, Dehra Dun. Supervisor: Dr. A.J.T. Johnsingh.

Fozia Hamid (2010): **A study on water bird population and**

human use of Hokersar and Hygam wetlands of Kashmir valley for conservation planning. Saurashtra University. Supervisor: Dr. S.A. Hussain.

G. Areendran (2009): **A study on vegetation ecology in Pench Tiger Reserve, Madhya Pradesh with reference to gaur (*Bos gaurus*) using remote sensing and GIS techniques.** Saurashtra University. Supervisor: Dr. K. Sankar.

Gajendra Singh (2009): **Diversity of vascular plants in some parts of Kedarnath Wildlife Sanctuary (Western Himalaya).** Kumaun University Nainital. Supervisors: Prof. K.R. Verma and Dr. G.S. Rawat.

Neha Midha (2009): **Land use, forest fragmentation and river dynamics in Dudhwa landscape and their conservation implications.** Saurashtra University. Supervisor: Dr. P.K. Mathur.

Rina Rani Singh (2009): **Characterization of bone, ivory, rhino horn and antler to deal with wildlife offence cases.** Forest Research Institute University, Dehra Dun. Supervisor: Dr. S.P. Goyal.

V. Meena (2009): **Reproductive strategy and behaviour of male Asiatic lions.** Forest Research Institute University, Dehra Dun. Supervisor: Dr. Y.V. Jhala. Co-supervisor: Dr. Ravi Chellam.

Theses Submitted

K. Rajapandian (2009): **Factors affecting habitat occupancy of tiger in the Terai Arc Landscape, India.** Saurashtra University. Supervisor: Dr. S.P. Goyal.

Rachna Tewari (2009): **A study on habitat use and food habits of swamp deer (*Cervus duvauceli duvauceli*) in Jhilmil Tal, Haridwar Forest Division, Uttaranchal.** Saurashtra University. Supervisor: Dr. G.S. Rawat.

Upamanyu Hore (2009): **Diversity and structure of spider assemblages in Terai Conservation Area (TCA).** Saurashtra University. Supervisor: Dr. V.P. Uniyal.

Registered

Abesh Kumar Sanyal (2009): **Diversity and distribution of moth assemblages along altitudinal gradient in Gangotri landscape, India.** Saurashtra University. Supervisor: Dr. V.P. Uniyal. Co-supervisor: Dr. Kailash Chandra.

Abishek Harihar (2009): **Assessing habitat occupancy, prey availability and viability of tigers in western Terai Arc Landscape, India.** Saurashtra University. Supervisor: Dr.

S.P. Goyal. Co-supervisor: Dr. Bivash Pandav.

A. Pragatheesh (2009): **Assessment of the existing National Highway-7 and its proposed widening on habitat use and movement of wild animals in Pench Tiger Reserve, Madhya Pradesh.** Saurashtra University. Supervisor: Dr. Asha Rajvanshi. Co-supervisor: Dr. V.B. Mathur.

Bitapi C. Sinha (2009): **Evaluating effectiveness of interpretative facilities in enhancing conservation awareness in select tiger reserves in India.** Bharati Vidyapeeth University. Supervisor: Dr. V.B. Mathur.

C. Sasikumar (2009): **Treatment of biodiversity issues in impact assessment of mining projects: Review of the environmental impact assessment practice in India.** Saurashtra University. Supervisor: Dr. Asha Rajvanshi.

Janmejaya Sathy (2009): **Ecology of Malayan sun bear (*Helarctos malayanus*) with special reference to human-sun bear conflict in and around Namdapha Tiger Reserve, Arunachal Pradesh.** Saurashtra University. Supervisor: Dr. N.P.S. Chauhan.

Jhamak Karki (2009): **Occupancy and abundance of tigers and their prey in Terai Arc Landscape, Nepal.** Forest Research Institute University, Dehra Dun. Supervisor: Dr. Y.V. Jhala. Co-supervisors: Dr. Bivash Pandav and Dr. Shant Raj Jnawali.

Khagendra Adhikari (2009): **Ecology, demography, conservation and management of greater one horned rhinoceros (*Rhinoceros unicornis*) in Chitwan National Park, Nepal.** Saurashtra University. Supervisor: Dr. Sushant Chowdhury.

Manish Bhardwaj (2009): **Diversity and structure of butterfly assemblages along altitudinal gradient in Tons valley, western Himalaya.** Saurashtra University. Supervisor: Dr. V.P. Uniyal. Co-supervisor: Dr. Arun Pratap Singh.

Merwyn Fernandes (2009): **Spatial pattern in the occupancy and abundance of red junglefowl (*Gallus gallus*) in western Shivalik landscape, India.** Saurashtra University. Supervisor: Dr. S. Sathyakumar. Co-supervisor: Dr. Philip J.K. McGowan.

Mousumi Ghosh (2009): **Distribution of breeding *Phylloscopus* and *Seicercus* warblers in the Himalayas: Role of ecomorphology and competition.** Saurashtra University. Supervisor: Dr. G.S. Rawat. Co-supervisor: Dr. Trevor Price.

Naresh Subedi (2009): **Effect of *Mikania micrantha* on the demography, habitat use and nutrition of greater one horned rhinoceros in Chitwan National Park, Nepal.** Forest Research Institute University, Dehra Dun. Supervisor: Dr. Y.V. Jhala. Co-supervisors: Dr. Rajan Amin and Dr. Shant Raj Jnawali.

Pradeep Vyas (2009): **Biodiversity conservation in Indian Sundarban in the context of anthropogenic pressures and strategies for impact mitigation.** Saurashtra University. Supervisor: Dr. V.B. Mathur.

Priyanka Bhatt (2009): **Ecology and management of savanna vegetation in Sariska Tiger Reserve, Rajasthan.** Forest Research Institute University, Dehra Dun. Supervisor: Dr. G.S. Rawat. Co-supervisor: Dr. K. Sankar.

Santanu Gupta (2009): **An assessment of livelihood dependency and anthropogenic pressures on tiger habitat in Kalakad-Mundanthurai Tiger Reserve of Tamil Nadu, India.** Saurashtra University. Supervisor: Dr. B.K. Mishra.

Shazia Quasin (2009): **Systematics and diversity of spiders (Araneae) in Nanda Devi Biosphere Reserve.** Saurashtra University. Supervisor: Dr. V.P. Uniyal.

Tawqir Bashir (2009): **An assessment of abundance, habitat use and prey selection by carnivores in Khangchendzonga Biosphere Reserve, Sikkim.** Saurashtra University. Supervisor: Dr. S. Sathyakumar. Co-supervisor: Shri Qamar Qureshi.

T. Bhattacharya (2010): **Developing spatial database and habitat modeling for ungulates in Khangchendzonga Biosphere Reserve, Sikkim.** University of Calcutta. Supervisors: Dr. S. Sathyakumar and Dr. G.K. Saha.

XXX Post-Graduate Diploma Course in Wildlife Management September 2008 to May 2009

The management term paper presentation on Dudhwa National Park by officer trainees was held on April 8, 2009. On completion of a management planning exercise at Periyar Tiger Reserve, Kerala, the officer trainees were assigned the writing and submission of the management plan during May 11-25, 2009. The valedictory function was held on May 28, 2009. Shri S.C. Dey, Secretary General, Global Tiger Forum, New Delhi was the chief guest on this occasion. He presented the awards and prizes to the deserving officer trainees. Officer trainees were awarded the Diploma in Wildlife Management on their successful completion of the course. Three trainees were awarded honours diplomas.



The Institute's Gold Medal for Top Trainee	Mr. Manoj V. Nair
Wildlife Preservation Society Silver Medal for Second in Merit	Mr. Gopal P. Bhattarai
Silver Medal for Best All Round Wildlifer	Mr. Manoj V. Nair
N.R. Nair Memorial Silver Medal for Best Management Plan	Mr. Manoj V. Nair
A.K. Chatterjee Silver Medal for Best Management Term Paper	Mr. Manoj V. Nair
Top Trainee in Wildlife Biology	Mr. Manoj V. Nair
Best Foreign Trainee	Mr. Gopal P. Bhattarai

XXXI Post-Graduate Diploma Course in Wildlife Management Course September 2009 to May 2010

The course commenced on September 1, 2009, with a duration of 9 months and a total of 11 officer trainees of the rank of DCFs/ACFs and equivalent ranks from India and abroad. Out of eight Indian officer trainees, two were from Maharashtra and one each from Andhra Pradesh, Arunachal Pradesh, Orissa, Assam, Uttar Pradesh and Rajasthan. In addition, there were three foreign nationals one each from Nepal, Afghanistan and Bangladesh sponsored by the Global Tiger Forum and the SAARC Wildlife Management Fellowship Scheme.

During the reporting period, a module on "Visitor Use Management and Interpretive Planning in Protected Areas, November 18-24, 2009" was opened for the lateral entrants, which was dovetailed in the PG Diploma Course. The following short tours and field trips were also undertaken by the officer trainees: (i) visit to Hathipaon on October 3, 2009; (ii) field trip to Shivpuri during November 20-22, 2009 to identify ecotourism destinations and resources and design interpretive/visitor centres—rock climbing and yoga classes were part of the camping tour; (iii) study tour at Corbett Tiger Reserve, Kalagarh (fringe villages) during January 1-4, 2010—the objective of this study tour was to expose the participants to various participatory tools and techniques for PA management planning besides issues of social information gathering for eco-development planning; (iv) a day-long exercise at Asan Barrage on January 15, 2010 as part of the course module on wetland management—the objective of the trip was to familiarize the officers with the migratory and resident birds; and (v) a visit to the Vulture



Conservation Breeding Centre, Pinjore, Haryana during March 18-19, 2010 to study the issues related to various aspects of the Vulture Conservation Breeding Programme.

Apart from the above, the officer trainees also visited the following local institutions and organizations: (i) Orientation Tour conducted at Rajaji National Park by establishing camp at Chilla Forest Annexe during September 21-26, 2009; (ii) High Altitude Techniques Tour conducted at Kedarnath Wildlife Sanctuary and Nanda Devi Biosphere Reserve during November 11-17, 2009; (iii) Techniques Tour held at Sariska Tiger Reserve, Rajasthan from November 25 to December 7, 2009 wherein techniques to conduct censuses and estimate plant and animal abundance were demonstrated and practiced; (iv) Management Tour covering Bandipur NP and TR during February 12-13, 2010; Mudumalai NP and TR during February 14, 2010; Parambikulam Wildlife Sanctuary on February 15, 2010; Periyar TR during February 17-18, 2010; Kalakad Mundanthurai TR on February 20, 2010; and National Zoological Park on February 5, 2010. The officer trainees undertook a tour of Malaysia and Singapore between February 25- March 6, 2010 as a part of the foreign component of the Management Tour. The purpose of the visit was to get a regional perspective and study a wide range of wildlife and protected area management practices and also to observe various conservation models in action. (v) The Management Term Paper Exercise was carried out at Dudhwa Tiger Reserve (Uttar Pradesh) during March 22-28, 2010. The information and data collected and computed were analysed, and a term paper report was developed by each of the participants. The term paper was presented along with recommendations at a seminar by individual officer trainees.

XXV Certificate Course in Wildlife Management November 2009 to January 2010

The XXV Certificate Course in Wildlife Management began on November 1, 2009. In all, 21 officer trainees of the rank of Range Forest Officers and equivalent from different states and union territories within the country and from abroad joined the course. Among them, 14 officer trainees were from India. There were seven foreign nationals from neighbouring Asian countries (one each from Bangladesh, Lao PDR, Indonesia, Nepal, Thailand and two from Bhutan), sponsored by the Global Tiger Forum (GTF) New Delhi. During this course much time was devoted to practical work.

The officer trainees undertook the Orientation-cum-



Techniques Tour at Rajaji National Park (Uttarakhand) from November 30 to December 11, 2009. The tour was conducted by establishing camp at Chilla Forest Annexe. The objective of this tour was to orient and familiarize trainees with different wildlife techniques. The Management Tour was conducted during January 3-21, 2010 in Gujarat. During the tour, the officer trainees visited the Gujarat Ecological & Educational Research Foundation and Centre for Environment Education, Nalsarovar Wildlife (Bird) Sanctuary, Wild Ass Sanctuary, Gulf of Kutch Marine National Park, Sakkarbagh Zoo, Gir National Park & Sanctuary and Velavadar National Park. The objective of this tour was to provide first-hand experience of various management practices related to habitat management, endangered species management, wildlife protection, captive management, eco-development, wildlife interface conflicts and tourism.

All the officer trainees completed the course successfully and were given certificates. The Honours Certificate was awarded to 12 officer trainees.

The Wildlife Conservation Gold Medal for the Top Trainee	Mr. Paresh C. Porob
The Best Foreign Trainee	Mr. Pema Thinley
Best All Round Wildlifer	Mr. Paresh C. Porob
Institute's Silver Medal for Wildlife Management	Dr. Sam Varghese

Training workshop for the field staff of Himachal Pradesh Forest Department, Sangla and Sarahan, April 20-25, 2009. Capacity building of field staff, mitigation of wild animals-human conflict with special reference to the leopard, bear and monkey problems and imparting training in physical and chemical restraint techniques were the objectives of the workshop. It was organised by WII and Forest Department, Himachal Pradesh Forest Department. More than 30 participants attended the workshop.

Training workshop for the field staff of Ambikapur Circle, Chhattisgarh, July 28-August 1, 2009. Capacity building of field staff, mitigation of wild animal-human conflict with special reference to elephant, leopard, sloth bear and monkey problems and imparting training in physical and chemical restraint techniques were the objectives of the workshop. It was organised by WII and the Forest Department, Chhattisgarh. More than 110 participants attended the workshop.

Training course on 'Environmental Impact Assessment for biodiversity conservation for Indian Forest Service Officers', Dehra Dun, September 7-11, 2009. This five-day course was organized by WII for the first time as the compulsory course for IFS Officers nominated by the Ministry of Environment & Forests. The course was designed to meet the objective of developing innovative ways to link biodiversity conservation with development and growth to help biodiversity conservation efforts succeed for ethical, cultural, ecological and economic reasons. The course has the following objectives: (i) improving the understanding of the mechanisms for mainstreaming biodiversity in the impact assessment for good reporting and sound decision making; (ii) improving the appreciation of the issues and conflicts related to development through ecologically sensitive areas; and (iii) evaluating experience by examining lessons from case studies. During the training programme, sessions were planned to discuss various approaches and valuations tools to mainstream biodiversity in impact assessment and development decisions so that field managers can be more empowered to review the best development options that adequately consider recognition of the conservation goals and effectively safeguard threatened bio-resources and

ecosystem services. A total of 20 participants attended the course.

Wildlife Techniques Tour for IGNFA Probationers (2008-2010 Batch) in Sariska Tiger Reserve, Rajasthan, November 1-6, 2009. The Wildlife Techniques Tour for IGNFA Probationers (2008-2010 Batch) was conducted in Sariska Tiger Reserve, Rajasthan by Dr. K. Sankar, Dr. Dhananjai Mohan and Dr. S. Sathyakumar of WII. Shri Arun Prasad and Shri Rajeev Sharma, from Indira Gandhi National Forest Academy, accompanied the probationers and facilitated conducting the programme. A total of 29 probationers underwent the Wildlife Techniques Tour, wherein field techniques pertaining to plant and wild animal quantification using direct and indirect evidence, radio-telemetry, mist netting and camera trapping were demonstrated.

Training course on wildlife survey and monitoring techniques for foresters of Bhutan, Dehra Dun, December 1-7, 2009. Based on a request from Royal Society for Protection of Nature (RSPN), Bhutan, WII organized this course for foresters of Bhutan. Eight participants serving in different PAs of Bhutan attended the course, which was held at WII, Rajaji National Park and Kedarnath Wildlife Sanctuary. The course included formal lectures and interactions at WII for two and a half days. The formal sessions at the beginning of the course included lectures by faculty on topics such as the biogeography of Bhutan and the eastern Himalaya; characteristics of wildlife habitats, evaluation and monitoring; fauna of Bhutan; survey techniques for mammals, birds, herpetofauna and insects; and the use of GPS and GIS. This was followed by field training on carnivore sign surveys, demonstration of camera traps, track plots and use of field equipment, and field exercises on line transects and dung counts at Chilla, Rajaji National Park. An introduction was made to high altitude wildlife and habitats, and training in survey and monitoring techniques including scanning and silent drive count methods was imparted in Kedarnath Wildlife Sanctuary. After the field training, formal sessions on data entry and analysis, report writing; presentation of case studies; and feedback and interaction with the Dean and Director, WII were conducted on the last day.

Two-week special short-term training programme for the Indian Revenue Service (Customs & Central Excise), Group 'A' Probationers of 60th Batch, Dehra Dun, December 14-24, 2009. The objectives of the training programme were to: (i) sensitize the participants to the unique biodiversity of India, its importance and the challenges of conservation; (ii) make the participants understand the gravity of issues related to the illegal trade in wildlife and wildlife products, and be aware of the available legal instruments to control this trade and role of custom officers; (iii) provide basic skills of forensic science for identification of important wildlife products in trade; and (iv) generate discussions and share experiences of field officers dealing with issues of trade at international borders.

The training programme was organised by WII and sponsored by the National Academy of Customs, Central Excise and Narcotics, Faridabad, Haryana. A total of 63 participants attended the course. This was the seventh such training programme organized by WII on the request of National Academy of Customs, Excise and Narcotics for their probationers. Different sessions and panel discussions were held, and the participants were also taken on a field visit.



Field supervision and training workshop on "Population and Ecology of Lion Tailed Macaque (LTM) in South Western Ghats", Kalakad Mundanthurai Tiger Reserve (KMTR), December 21-22, 2009. The Department of Science and Technology (DST), Government of India provided funding support to conduct a field level workshop to disseminate the research findings as well as to train the frontline staff of KMTR in population monitoring of primates with a special focus on the LTM. Part-funding was also provided by WII. The workshop was attended by eminent managers and conservationists. Thirty-two frontline staff of KMTR including forest range officers, foresters, forest guards, forest watchers and anti-poaching watchers participated in the workshop.

One-week compulsory training programme on

"Ecotourism and Livelihoods" for IFS Officers, Periyar Tiger Reserve, Thekkady, Kerala, January 4-8, 2010. This training programme was sponsored by the Ministry of Environment and Forests, Government of India, New Delhi. The objectives of the training programme were to: (i) understand the concept and broad principles of ecotourism; (ii) demonstrate how ecotourism could be used as a tool for the livelihood security of local people and biodiversity conservation; (iii) expose the participants to a few important community based ecotourism initiatives in the southern Western Ghats; and (iv) share the experiences of participants with ecotourism from different parts of India.

A total of 21 participants attended the training. The first day of the training programme was utilized for understanding the concept and principles of ecotourism, livelihoods and the linkages between biodiversity conservation, ecotourism and livelihoods of local people. The learning was mostly field based. The participants were taken to different sites in and around Periyar, where an ecotourism programme is in operation. The participants interacted with the ecodevelopment committees (EDCs) involved in these programmes as well as the staff and officials. They were taken to Eravikulam National Park to understand the functioning of the Forest Development Agency for these programmes. On the last day, there was sharing of the experiences of different States by the participants. The final session was used to consolidate the learning of the training programme and devise broad recommendations for implementation of ecotourism programmes in other areas.

A training programme on "Wildlife Conservation: Issues and Concerns", Kanha Tiger Reserve, February 1-3, 2010. The training programme was conducted for representatives of the Indian Army in the state boards for wildlife at Kanha Tiger Reserve, Madhya Pradesh. There were 14 participants of the rank of brigadier and above. This was the third such training programme for army officers nominated to represent the Indian Army in the various state boards for wildlife.

Training workshop for IFS officers on "Managing Landscapes, Corridors and Connectivity for Biodiversity Conservation: Challenges and Way Forward", Dehra Dun, February 3-4, 2010. The objectives of the training workshop were to: (i) introduce the concepts and broad principles of the landscape approach to biodiversity conservation; (ii) share and discuss the existing experience of landscape scale research and management initiatives in India and elsewhere; and (iii) explore the ways and means of integrating the landscape approach in the



existing management systems for biodiversity conservation. It was jointly organized by WII and the Ministry of Environment and Forests. In all, 25 officers participated in the workshop. Different sessions and panel discussions were held, and the participants were also given group work as a part of the workshop.

Two-week special course in wildlife protection, law and forensic science for the Indian Revenue Service (Customs and Central Excise) Group A probationers of 60th batch (second group), Dehra Dun, February 8-19, 2010. The objective of the course was to sensitize the participants to the unique biodiversity of India, its importance and the challenges of conservation and to the gravity of the issues related to illegal trade in wildlife and wildlife products, available legal instruments to control this trade and the role of custom officers. Providing basic skills of forensic science for identification of important wildlife products in trade was another objective.

This course was attended by a group of 63 officers. The training module aimed at sensitizing the young officers towards the wildlife trade in the country and to their role in checking it. Apart from providing indoor inputs, the officers were also taken to Asan Barrage and protected areas such as Corbett National Park, where they had interactions with



forest officers. Jungle safaris in the Dhikala and Bijrani areas of Corbett National Park sensitized them not only towards flagship species but also some other lesser known keystone species.

The Training of Trainers: Tiger conservation practitioners' course, Dehra Dun, February 20-March 26, 2010. The Global Tiger Initiative of the World Bank organized a course through the Smithsonian Institution, Washington, DC in collaboration with WII for training Tiger Range Country personnel in tiger conservation practices. The main objectives were to enhance the protected area managers and conservation practitioners' understanding of the complex and multifaceted nature of tiger conservation, the tools and mechanisms available for conservation practice and the possible course of actions that can be taken to improve conservation practices that benefit animals, people and the environment. The first part of the course was conducted in India for six weeks. A total of 25 applicants were selected from a pool of over 175 qualified applicants and government nominees from Bangladesh, Bhutan, India, Nepal, Malaysia, Russia and Thailand. Applicants were chosen to ensure good representation of geographic areas, affiliations (academic, government and NGO sectors) and levels and types of expertise.

To provide proper exposure to course participants, theoretical and practical sessions were conducted in five locations, including WII, National Zoological Park, New Delhi, Rajaji National Park, Pench National Park and Kanha National Park. The scientists from WII facilitated coordinating the logistics for the course. They conducted most of the field exercises and lectures in Pench and Kanha national parks. Over 50 resource persons from five countries provided their inputs for the course. The course provided opportunities for lectures, demonstrations, hands-on exercises and discussions. Multiple case studies from the region were presented, and participants interacted with key persons involved with those case studies. Networking and



team building was a key aspect of the training. Participants engaged with each other and resource persons during formal and informal sessions. During the interim between Part I and Part II of the course, participants will work on their Personal Leadership Plan and Group Implementation projects. A major component of the course is the practical training through field projects to be carried out after the US training component.

Training workshop on “Wildlife Conservation: Issues and Challenges”, Dehra Dun, March 8-12, 2010. The Department of Science and Technology (DST) has launched a scheme called the “National Training Programme for Scientists & Technologists Working in Government Sector”. As a part of this scheme, training programmes are initiated exclusively for women scientists/technologists. WII organized this one-week training workshop at its campus. The objectives of the program were to enable the participants to: (i) get appraised of the current trends and challenges in biodiversity and wildlife conservation; (ii) appreciate the issues related to balancing conservation and livelihood aspirations of natural resource dependent communities; (iii) understand the problems and prospects of mainstreaming wildlife conservation issues in the development processes; (iv) get an idea of the legal issues in conservation; (v) get an exposure to the field situation and some key issues in conservation by visiting Rajaji National Park, Uttarakhand; and (vi) interact

with other professionals in the field. Twenty women scientists from institutions all over the country participated in this program.

Training programme on “Ecotourism for the Frontline Staff of Uttarakhand Forest Department”, Dehra Dun, March 15-17, 2010. On the request of the Ecotourism Wing of the Uttarakhand Forest Department (UKFD), the training programme was organised for the frontline staff of UKFD. In this training programme 22 staff members and officials from different forest divisions of Uttarakhand participated. The broad objectives of this training programme were to: (i) understand the concept and principles of ecotourism; (ii) emphasize the role of local communities in management of ecotourism; (iii) debate on various issues related to management of ecotourism; and (iv) share the experience of ecotourism in India with participants and understand the role of the staff in the programme. The training programme was conducted on the principle of adult learning. This involved different methods, which focused on the experience of the participants. The training sessions were conducted by in-house and outside faculty members. Programme was able to build a better understanding about the concept and management of ecotourism among the participants, and it could help in devising a broad understanding of the future programme in the state. The programme was conducted in Hindi.



Vinod Verma

capacity building

Workshops, Seminars & Conferences

Organized

Participated

Workshops, Seminars and Conferences Organized

Capacity building workshop in management of wild animals in distress at Rakhchum-Chitkul, Sangla, April 22-24, 2009. This training workshop on the management of wild animals in distress at Rakhchum-Chitkul, Sangla for officers, frontline staff and veterinarians working in Himachal Pradesh was jointly organized by WII and the Himachal Pradesh Forest Department (HPFD). It was organized with the objective of sensitizing the managers, veterinarians and frontline staff of HPFD to various management options and strategies required in dealing with man-animal conflicts. An emphasis was laid on ethical, humane and scientific management of wild animals in distress. Besides teaching inputs, a hands-on exercise on dart assembly and handling of equipments was carried out.

'Re-tooling impact assessment for incorporating ecological and economic valuation approaches for mainstreaming biodiversity' at Accra, Ghana, May 17-18, 2009. This was one of the courses that were organized in response to a request from the International Association for Impact Assessment (IAIA) for conducting pre-meeting training courses in conjunction with its Annual Meeting. The two-day course was targeted at EIA professionals, the conservation community, business groups, planners, corporate environmental managers, decision-makers and other professionals committed to more responsible project planning through better integration of biodiversity in business or planning decisions. The objectives of the course were to (i) provide a theoretical rationale for recognizing the importance of biodiversity in impact assessment; (ii) promote an understanding of how humans value the functions and services that flow from biodiversity conservation and how the decline in benefits from these services is reflected in economic terms; (iii) stimulate the importance of integrating economic valuation principles in the EA framework for mainstreaming biodiversity in impact assessment; (iv) build the capacity of participants to use economic techniques for valuing biodiversity and incorporating values into the decision-making process; and (v) introduce regulatory and market-based mechanisms for integrating biodiversity into mitigation planning for biodiversity.

The course was organized by IAIA. Nine participants from four countries attended the course.

V Internal Annual Research Seminar (IARS), September 17-18, 2009 and XXIII Annual Research Seminar (ARS) of WII, Dehra Dun, September 19-20, 2009. During the IARS, 22 presentations were made in five sessions, which included studies on large carnivores, herpetofaunal studies, human dimensions and development related aspects, avifauna, molecular genetics and forensics, and arthropods. The presentations made by M.Sc. students, research fellows and faculty members of WII were based on recently initiated and ongoing research studies. The following were adjudged as the five best presentations made, and the concerned researchers were awarded book prizes each worth Rs.1500.

Book Awards for Best Presentations

V Annual Internal Research Seminar

- | | | |
|-----|------------------|--|
| I | Kausik Banerjee | Ecology of lions with emphasis on the agro-pastoral landscape of Gir |
| II | A. Pragatheesh | Impact of a national highway on habitat quality and movement of wild animals in Pench Tiger Reserve, Madhya Pradesh |
| III | Shilpi Gupta | Population estimation and food habits of striped hyaena (<i>Hyaena hyaena</i>) in Sariska Tiger Reserve, Rajasthan |
| IV | Shazia Quasin | Diversity of spiders along an altitudinal gradient in Nanda Devi Biosphere Reserve, Uttarakhand |
| V | Abesh Kr. Sanyal | Monitoring moth diversity in Gangotri Landscape, Uttarakhand |



A total of 24 presentations were made in nine sessions in the XXIII Annual Research Seminar (ARS) of WII. These included studies on large carnivores, avifaunal studies, molecular genetics and forensic studies, and studies on coastal and marine biodiversity, herpetofauna, small mammals and primates. The presentations in the ARS were based on the ongoing research studies. About 270 delegates/participants attended the ARS, including the Principal Chief Conservators of Forests, Chief Wildlife Wardens and other senior officials representing state forest departments, delegates representing various NGOs, scientists, wildlife experts, conservationists, faculty members, researchers, M.Sc. students and officer trainees.

A panel including eminent scientists, academicians, conservationists and wildlife managers adjudicated the relevance and quality of research by the presentations made. Five presentations were adjudged as the best presentations. All five researchers were given book awards, each worth Rs.1500.

Book Awards for Best Presentations

XXIII Annual Research Seminar

I	Sutirtha Dutta	Role of environmental stochasticity and habitat management in designing conservation strategy for the great Indian bustard
II	Mukesh	Genetic diversity and admixture analysis of red jungle fowl with domestic chicken
III	Sumithra	Social behaviour and duetting in hoolock gibbons (<i>Hoolock hoolock</i>)
IV	Mousumi Ghosh	Foraging behaviour and habitat characteristics of breeding leaf warblers in the Himalayas
V	M. Muralidharan	Effects of anthropogenic changes on the nest sites selection of olive ridley sea turtles in Rushikulya, Orissa



Department of Science and Technology (DST) Fast Track Young Scientists Programme Expert Panel Meeting, Dehra Dun, September 30 to October 1, 2009.

The Department of Science and Technology (DST), Government of India, New Delhi has been providing financial assistance to young scientists in various areas of their interest through the fast track research project programme. They have periodical meetings in various parts of the country in different academic and research organisations so as to provide a platform to young researchers and students of the concerned institute so as to have the benefit of interaction with the members of the expert committee. For the first time, the expert panel meeting was held at WII. Ten experts from various Indian universities and research institutions along with the Director, Science and Engineering Research Council of DST (SERC-DST), evaluated the project proposals submitted by the young scientists in the life sciences category.



Regional workshop for Asia and the Pacific on the review of progress and capacity building for the implementation of the PoWPA, Dehra Dun, October 12-15, 2009. In February 2004, the CBD Parties made the most comprehensive and specific protected area commitments ever made by the international community by adopting the Programme of Work on Protected Areas (PoWPA). The Programme of Work enshrines development of participatory, ecologically representative and effectively managed national and regional systems of protected areas, where necessary stretching across national boundaries. From designation to management, the Programme of Work can be considered as a defining framework or "blueprint" for protected areas for the coming decades.

At the ninth meeting of the Conference of Parties (CoP) in Bonn in 2008, the CBD CoP decided to undertake an in-depth review of the Programme of Work at its 10th meeting in Nagoya, Japan and, requested the Executive Secretary to convene regional and sub-regional capacity-building and

progress-review workshops for preparing the in-depth review for consideration by the Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA) prior to COP-10. With this background a "Regional Workshop for Asia and the Pacific on the Review of Progress and Capacity Building for the Implementation of the PoWPA" was organized by the Secretariat of the Convention on Biological Diversity in collaboration with the Ministry of Environment and Forests, Government of India and hosted by WII. The workshop reviewed the best practices and lessons learned, to identify current shortcomings or omissions and suggest ways and means to strengthen the implementation of the Programme of Work on Protected Areas. A total of 64 representatives from 28 countries participated in this workshop.

Interactive workshop on "Wildlife Conservation Issues for Media Personnel", New Delhi, December 9-10, 2009. In the prevailing situation of development and growing pressures on wilderness areas, wildlife conservation in India concerns planners, administrators, managers and conservationists alike. The future of India's wilderness and wildlife will depend on responses to declining populations of critically endangered species, fragmentation of their habitats, increasing human-wildlife conflicts and demands of wilderness areas for developmental purposes, livelihood and livestock.

The media has not only kept the concern for wildlife conservation in the lime light but has also influenced policy makers to chart out appropriate conservation strategies. An interactive workshop was organised by WII at India Habitat Centre for media personnel to share these concerns regarding wildlife conservation in India and provide a platform to generate ideas on informative news reporting about current wildlife crisis. Shri Jairam Ramesh, Minister of State (Independent Charge), Environment and Forests, Government of India inaugurated the workshop. The workshop provided: (i) a comprehensive understanding of

the subject and information on the current situation and challenges; (ii) an opportunity to interact with the experts and exchange of information and ideas to foster media involvement in raising awareness about wildlife conservation issues; and (iii) networking and the opportunity to develop a specialised wildlife journalism group. A total of 23 participants from different media participated in this interactive workshop.

Phase-III: Mid-Career Training of Indian Forest Service (IFS) Officers: Wildlife and Biodiversity Conservation Module, Dehra Dun, January 4-13, 2010 and Colorado February 28 - March 13, 2010. As a part of the eight-week long mid-career training (Phase III) training of IFS officers of 7-9 years of service, a wildlife and biodiversity conservation module was organized by WII in collaboration with Colorado State University (CSU), USA. Altogether, 59 IFS officers participated in the training. Only half of the group participated in the CSU overseas component as the other half of the group went to Sweden for training focusing on traditional forestry. The objectives of the module were to: (i) provide an exposure to the current scenario in wildlife and biodiversity conservation in India and abroad; (ii) facilitate understanding of various conservation approaches and good wildlife management practices; and (iii) enable participants to appreciate the conservation challenges and the strategies to be developed for effective wildlife and biodiversity conservation.

The training at CSU was jointly designed by two departments of Warner College of Natural Resources, viz., Human Dimensions of Natural Resources (HDNR) Department and the Centre for Protected Area Management and Training (CPAMT) of CSU, with the overall theme of protected area management, and planning and human dimensions of wildlife management. The modules were delivered through a series of learning units each focusing on a particular sub-theme within the wildlife and biodiversity conservation sector. About one-third of the time of the



modules was spent in field visits to protected areas in the surrounding landscapes of the Himalayan foothills and the Rocky Mountains. These visits provided an opportunity to link theory with the practice of wildlife management. The inland module was delivered by a team of experienced WII faculty and eminent national resource persons. The module CSU was primarily delivered by the faculty and invited speakers from conservation agencies in Colorado and Alaska, including the US Forest Service, US National Park Service and state forest and wildlife departments.

Capacity building workshop in management of wild animals in distress, Gopalpur Zoo, Himachal Pradesh, January 28-30, 2010. Based on a request from the Himachal Pradesh Forest Department, a training workshop for building capacities in managing wild animals in distress was jointly organized by WII and the Himachal Pradesh Forest Department. The workshop was organized with the objective of sensitizing the managers, veterinarians and frontline staff of HPFD to various management options and strategies in successful rescue and rehabilitation of wild animals. The workshop was attended by 41 participants representing various strata of the Forest Department working in the Hamirpur, Una, Chamba, Spiti, Nurpur, Dehra, Sundernagar and Palampur forest divisions. Live demonstration of field procedures such as immobilization, biological sampling and monitoring of immobilized animals were carried out on leopards.

Consultation workshop for state forest secretaries, principal chief conservators of forests and chief wildlife wardens on “Emerging Trends and Future Challenges in the Wildlife Sector”, Tarangi Retreat, near Corbett Tiger Reserve, February 12-13, 2010. The workshop was attended by 30 delegates. The delegates, from Tiger Range states, included forest secretaries from

Maharashtra, Assam, Mizoram, Madhya Pradesh, Tamil Nadu and Orissa; principal chief conservators of forests from Andhra Pradesh and Uttarakhand; principal chief conservators of forests and chief wildlife wardens from Andhra Pradesh, Tamil Nadu, Maharashtra, Rajasthan, Karnataka, Madhya Pradesh, Orissa and Uttarakhand; the Additional Principal Chief Conservator of Forests (Wildlife) of West Bengal; and the chief conservators of forests (wildlife) from Assam, Jharkhand, West Bengal and Arunachal Pradesh. The Inspector General of Forests (Wildlife) represented the Ministry of Environment and Forests, Government of India in the workshop. Shri Brijendra Singh, Member, National Board of Wildlife and Member, WII Society, the Field Director, Corbett Tiger Reserve, the Deputy Field Director and some other senior officials from Uttarakhand Forest Department also participated in the workshop.

The deliberations of the workshop focused on two critical issues related to tiger conservation. Firstly, the NTCA's directives on the all-India monitoring of the tiger, co-predators, prey and habitats, critical tiger habitats, notification of buffer zones of tiger reserves and relocation of villages from critical tiger habitats; and secondly, the man-animal conflict issues related to some of the conflict species—the elephant, sloth bear, brown bear, rhesus macaque, bonnet macaque, nilgai and wild pig—and the possible mitigation strategies. The workshop provided a forum to deliberate on various emerging issues and possible management interventions to effectively deal with the challenges. Various doubts about the advisories from the NTCA could also be clarified by the delegates. A half-day field visit to Corbett Tiger Reserve was also organized for the delegates during the workshop in order to witness the wilderness and biodiversity and to understand some of the management issues of the reserve.

Workshops, Seminars and Conferences Participated

Training workshop on "Management and Conservation of World Heritage Sites – Conservation for Peace", Hiroshima, Japan, April 19-24, 2009. The United Nations Institute for Training and Research (UNITAR) organized this training workshop. The 2009 training workshop was designed with the following specific objectives: (i) to review the basics of the World Heritage regime and its implications for peace, incorporating available information, updates and current trends; (ii) to elucidate the underlying principles of "values-based heritage management", with a particular focus on peace building and reconciliation; (iii) to consider the role of heritage in war-torn, post-conflict or post-disaster situations; (iv) to examine leading policies and strategies, identifying best practices and lessons learned; (v) to create management plans for sites, using nomination dossier or periodical-reporting formats; and (vi) to enhance peer learning and exchange among the participants. The workshop was attended by over 43 participants, resource persons and staff, representing 24 countries from Asia, Europe and the Pacific islands. Dr. V.B. Mathur was invited as a resource person in this training workshop. He also participated in the round table organized by UNITAR on "Building for Peace".



First WCPA – Asia Steering Committee Meeting in Bangkok, Thailand, May 3-5, 2009. The Regional Protected Area Programme (RPAP), IUCN-Asia organized the first meeting of the World Commission on Protected Areas (WCPA) Asia Steering Committee in Bangkok, Thailand. This meeting was the critical first step towards planning how WCPA–Asia could best contribute to the region's priority protected area (PA) activities, in particular, wise use of natural resources, adaptation to climate change, freshwater issues, transboundary PAs and other thematic areas. In addition, this meeting provided an opportunity to discuss innovative approaches towards WCPA–Asia's



governance, management and operating structure during the period 2009-2012. Dr. V.B. Mathur, who is the Deputy Vice-Chair of the South Asian Region and National Coordinator for India, was invited to provide inputs in this meeting.

Symposium on "Tiger: Last and Final call", Chennai, May 4, 2009. Dr. Y.V. Jhala delivered a talk on the status and conservation of tigers in India, in a seminar organized by Sanctuary India.

Conference with theme "Impact Assessment and Human Well-Being" of the International Association of Impact Assessment (IAIA), Accra, Ghana, May 17-22, 2009. The conference theme for IAIA'09, "Impact Assessment and Human Well-Being", provided EIA professionals with an opportunity to reinforce the links between human well-being and the protection of ecosystems. The technical sessions planned at the conference aimed at promoting good practices in impact assessment for the evaluation of proposed development policies, plans, programmes, and projects (PPPPs) to ensure a healthy environment, human well-being, sustainable development, protected ecosystems and the quality of life.

Dr. Asha Rajvanshi and Dr. V.B. Mathur attended the 29th Annual Conference of the International Association of Impact Assessment (IAIA). Dr. Rajvanshi presented the paper "Assessing Landscape Level Impacts of a Coal Mine", and Dr. V.B. Mathur presented the paper "Ecological Compensation for a Hydropower Project". Dr. Asha chaired the sessions (i) CS2.2 Issues and Success Stories: EA in Agriculture, Forestry, and Fisheries/Biodiversity; and (ii)

CS4.3 Mainstreaming Biodiversity in Impact Assessment for Human Well-Being. Dr. V.B. Mathur chaired the session CS8.1 Documenting Good Practices in Biodiversity: Inclusive Impact Assessment for Sustainable Development? The participation of both faculty members was funded by IAIA under the "Capacity Building in Biodiversity and Impact Assessment" (CBBIA) project and in part by an in-kind contribution from EPA Ghana.

Workshop on "Rescue and Rehabilitation", Bhopal, May 25-26, 2009. The workshop was organized at R.C.V.P. NORONHA Academy of Administration, Bhopal by the Madhya Pradesh Forest Department. The workshop was organized to review the efforts put in by various rescue teams in the state. Dr. Parag Nigam was invited as a resource person for the workshop. The major areas of deliberations included the necessity for species specific veterinary protocols, capacity building and enhancement of the skill of frontline staff, veterinarians and managers, information management and dissemination, upgradation of facilities and infrastructure and personnel management.

National workshop on "Evaluation of Research Projects for Planning the 29th Indian Scientific Expedition to Antarctica", Goa, June 11-12, 2009. The National Centre for Antarctic and Ocean Research (NCAOR), Goa organized the national workshop for planning the 29th Indian Scientific Expedition to Antarctica. Dr. S. Sathyakumar participated in this workshop and made a presentation, "Long-Term Monitoring of Wildlife in the Southern Indian Ocean and Antarctica", that summarized the results of the activities carried out by WII in the 28th Indian Scientific Expedition to Antarctica.

National workshop on "Lessons Learnt From Tiger Re-introduction in Sariska", Sariska, Rajasthan, June 28, 2009. The Government of Rajasthan and the National Tiger Conservation Authority (NTCA) organized this workshop under the chairmanship of Shri Jairam Ramesh,



the Hon'ble Minister of Environment and Forests, Government of India. The Director of WII, Shri P.R. Sinha, Dean, Dr. V.B. Mathur, Dr. Y.V. Jhala, Shri G.S. Bhardwaj and Dr. K. Sankar participated in this workshop. Dr. V.B. Mathur made a presentation on "Issues, Conjectures and Learnings from Tiger Re-introduction in Sariska", and Dr. K. Sankar made a presentation on "Reintroduction of Tigers in Sariska Tiger Reserve, Rajasthan".

International conference on "Water, Environment, Energy and Society—2009", Firozabad, June 28-30, 2009. This conference was organized by the International Sociological Association. Dr. Pranab Pal attended the conference and presented a paper entitled "Conservation Planning for India: Perspective for Future".

Workshop for IFS officers on "Landscape Approach to Conservation and Livelihoods", New Delhi, July 1-2, 2009. The workshop was organized by WinRock International India, and Dr. K. Ramesh was invited to be a resource person for the session "Applying Landscape Ecology Principles for Conservation and Livelihoods". The aim of the workshop was to provide an insight on the emerging concept of a landscape approach to wildlife conservation and livelihood issues to the decision makers. There were a series of presentations and experience sharing in the form of discussions and group work. Dr. Ramesh delivered a lecture on "Applying Landscape Ecology Principles in Forest and Wildlife Management", mainly dealing with the science and philosophy of the landscape ecology.

Fourth meeting of the State Board of Wildlife, Gandhinagar, Gujarat, July 4, 2009. This was the fourth meeting of the State Board for Wildlife, Gujarat as per the provisions/requirements of the Wildlife (P) Act, 1972. It was convened by the Principal Chief Conservator of Forests (Wildlife), and Chief Wildlife Warden (CWLW), Gujarat State. The meeting was chaired by the Hon'ble Chief Minister of Gujarat. The board reviewed the major activities of the Wildlife Wing, Forests Department in the field of wildlife conservation in the state of Gujarat and considered and approved several different proposals seeking regularization/approval under Section 29 of the Wildlife Protection Act submitted by the CWLW and the Member Secretary. Dr. P.K. Mathur attended the meeting and provided inputs on various agenda items.

Training workshop on "Wildlife Enforcement", Nagpur, August 1-2, 2009. Dr. S.K. Gupta participated in this training workshop, which was organized by WWF/TRAFFIC-India and the Maharashtra State Forest

Department at Nagpur. He presented a paper on "Application of Forensic Science in Wildlife Cases".

25th European Conference of Arachnology, Alexandroupolis, Greece, August 16-21, 2009. The European Society of Arachnology facilitates exchange between researchers or institutes all over the world. Annual meetings are held in different research institutions and universities of Europe. In the congress, 92 scientists representing 29 countries from all over the world presented their oral and poster presentations. Various interesting aspects of spiders were covered in different presentations by scientists working on arachnology. Dr. V.P. Uniyal attended the conference and presented the findings of the ongoing DST project on "Diversity of Spiders in High Altitude Ecosystem, Nanda Devi Biosphere Reserve—The World Heritage Site, India". The Department of Science and Technology, New Delhi provided financial support for participation in the conference.

Second national workshop on "Critical Wildlife Habitats and Community Forest Rights", New Delhi, August 17-19, 2009. The objectives of the national workshop were to: (i) discuss the process and the issues of identification of critical wildlife habitats for PAs in India and (ii) understand the issues of community forest rights while deciding the critical wildlife habitats. It was organized by Future of Conservation Network, New Delhi. The workshop debated upon the process of identification of critical wildlife habitats for the protected area network in India. The progress of the task of settlement of community forest rights in different states was also discussed. Dr. A.K. Bhardwaj attended the workshop.

National conference of Ministers of Environment and Forests, New Delhi, August 18, 2009. The Union Minister of Environment and Forests has called a meeting of all the forest ministers of states and union territories, prominent persons related to forestry, wildlife conservation and environmental management and representatives of various organizations working under the MoEF so as to discuss priority subjects related to forestry, wildlife and environment management. The meeting was convened by the MoEF, New Delhi and held at Vigyan Bhavan. The conference was chaired by Shri Jairam Ramesh, the Hon'ble Union State Minister (Independent Charge), Environment and Forests. The Hon'ble Prime Minister also briefly attended the conference and addressed the august gathering. The conference was also attended by the Vice Chairman, Planning Commission and the chief ministers of select states. Priority topics of concern were deliberated on. Dr. P.K.

Mathur attended the conference.

Regional workshop on "Innovative Tools and Experiences in Mountain Ecosystems Management", Kathmandu, Nepal, August 31-September 3, 2009. The workshop was organized by IUCN-Nepal and ICIMOD at Kathmandu on the Hindu Kush Karakoram Himalayan (HKKH) Region Partnership Project, implemented in Sagarmatha National Park, Nepal; Central Karakoram National Park (CKNP), Pakistan; and Qomolongma National Nature Reserve (QNNP), Tibet. A significant outcome of the project was the Decision Support Tool (DST), a GIS based decision making tool. The workshop was aimed at disseminating the DST tool among the partners and other regional countries to explore the possibility of scaling up its utility. The HKKH Partnership Project was supported by the Italian Government and implemented by IUCN in partnership with ICIMOD (Nepal), Ev-K2-CNR and CESVI (both are Italy based organizations, active in Nepal). The primary objective of the project was to consolidate institutional capacity for systemic planning and management at the local, national and regional levels focusing on poverty reduction and biodiversity conservation in the HKKH region. The findings were shared by the partner organizations such as ICIMOD, Kathmandu University, Tribhuvan University (Nepal), IUCN, WWF-Pakistan, Chinese Academy of Sciences, Ev-K2-CNR and CESVI. In addition to these partner countries, the participants also included people from India, Bangladesh and Myanmar. Dr. K. Ramesh participated in the workshop.

Conference on Cheetah Reintroduction, Gajneer, Rajasthan, September 7-10, 2009. Dr. Y.V. Jhala provided technical inputs and made the lead presentation on "Assessing the Potential for Cheetah Reintroduction in India".

Workshop on "Source, Treatment and Distribution of Drinking Water", Dehra Dun, September 14-15, 2009. This Indo-German workshop was jointly organized by Uttarakhand Council of Science and Technology (UCOST); Uttarakhand Jal Sansthan (UJS); Cooperation Centre for River Bank Filtration (CCRFB) Haridwar; and University of Applied Sciences, Dresden, Germany at Indian Council of Forestry Research and Education (ICFRE), Dehra Dun. The objectives of the workshop were to make safe drinking water available to the masses and to emphasize the need for strengthening the Water Conservation Mission by sharing the research outcomes and practical knowledge in river bank filtration (RBF) with a vision to contribute to the further improvement of drinking water quality and the reduction of waterborne diseases in India. Dr. Asha

Rajvanshi attended the workshop and participated in the deliberations.

International workshop on the “Future of the CBD Programme of Work on Protected Areas (CBD/PoWPA)”, Jeju Island, Republic of Korea, September 14-17, 2009. The IUCN–The World Conservation Union—organized this international workshop. The goal of this meeting was to review the CBD/PoWPA to enhance its effective contribution to achieve the CBD Goals in relation to the conservation and sustainable use of biological diversity. The key objectives of the workshop were to: (i) assess key lessons learned on the implementation of the CBD/PoWPA—successes and pitfalls; (ii) identify ways and means and practical actions required at the regional, sub-regional and national levels to further enhance its scope and implementation, including implementation of the COP 9 decision on protected areas; (iii) consider key emerging issues—such as those associated with climate change—and other important issues such as management effectiveness, programme element 2 of PoWPA and restoration issues—that need to be further expanded or included in the PoWPA or in the COP X decision; and (iv) agree on a strategy on how to promote a renewed mandate for an enhanced CBD/PoWPA to be adopted by the parties of the CBD at CBD/COP10. Dr. V.B. Mathur, who is the Deputy Regional Vice Chair of WCPA-Asia and CBD Focal Point of POWPA provided professional inputs in this workshop.

International conference on “Sundaland Amphibian Biology” at the University of Malaysia, Sarawak, Malaysia, September 28 to 3 October 2009. The objective of the conference was to synthesize the systematics, ecology, morphology, biogeography and conservation related to the amphibians of South-east Asia. The meeting intended to give various research groups in the region a platform for exchange information, collaborate and network. It was organized by the University of Malaysia, Sarawak, Malaysia.

Several research groups have been interested in amphibians and have conducted active research in the Sunda region in parallel. These results show that the biodiversity of the Sunda amphibians has been clearly underestimated, making the region one of the richest in amphibian species in the world. Most of the new discoveries have been made from montane regions and offshore islands, but important findings have also been made not too far from the urban areas. Despite the intensified interest in amphibians in the Sunda region, it has also become evident that for known species even baseline data about the life history,

reproduction, larval life, and ecological needs of many known species are missing. The Sunda region holds a wealth of research opportunities for the future, some of which can only be addressed if research groups collaborate. The meeting gave various research groups in the region a platform to exchange information, collaborate and network. Dr. K. Vasudevan participated in the conference. Two papers on amphibian diversity and biogeography from WII were presented at the conference.

UGC sponsored national workshop on “Spider Taxonomy and Behaviour”, Warud, Maharashtra, October 3-4, 2009. Dr. V.P. Uniyal attended this national workshop, which was organized by the Department of Zoology, Amravati University, at Warud. He also chaired the session during the workshop presentation.

International conference on 'Hangul and Other Endangered Deer Species', Srinagar, Kashmir, India, October 10-12, 2009. The Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir (SKUAST-K), in collaboration with the Department of Wildlife Protection, J&K; Ministry of Environment & Forests, Government of India; WII; CZA; WWF-India; BNHS; and J&K Tourism organized this international conference. WII provided technical inputs in the editing and compilation of abstracts and in planning the conference programme. Dr. K. Sankar, Dr. S. Sathyakumar, Shri Qamar Qureshi, Ms. Samina Amin Charoo and Shri Lalit Kumar Sharma participated in this conference and presented papers.

XIII World Forestry Congress, Food and Agriculture Organization of the United Nations, Buenos Aires, Argentina, October 15-26, 2009. Dr. R. Badola participated and presented papers at the XIII World Forestry Congress, Food and Agriculture Organization of the United Nations.

National workshop on '11th Plan Mid-Term Appraisal' New Delhi, October 20, 2009. The MoEF organized this national workshop under the chairmanship of Dr. K. Kasturirangan, Member, Planning Commission. Dr. V.B. Mathur participated in this workshop and made a presentation on “Management Effectiveness Evaluation (MEE) of National Parks, Wildlife Sanctuaries and Tiger Reserves in India”.

Delhi high level conference on “Climate Change: Technology Development and Transfer”, Vigyan Bhawan, New Delhi, October 22-23, 2009. The conference was organized by the Ministry of Environment and Forests in

association with the Federation of Indian Chambers of Commerce and Industry (FICCI). The high level conference aimed to bring together high profile and accomplished experts from India and abroad to share their perspectives on issues relating to technology development and transfer in the context of climate change. Dr. V.B. Mathur and Dr. Asha Rajvanshi participated in the two-day conference.

Global Tiger Workshop, Kathmandu, Nepal, October 26-31, 2009. Dr. Y.V. Jhala attended the workshop as a resource person for the National Tiger Conservation Authority. He made a presentation as a part of a panel discussion on Tiger Friendly Infrastructural Development.

Seminar on “Ecotourism-Relevance for India: Experiences, Challenges and Future Prospects”, New Delhi, October 31, 2009. The objectives of the seminar were to: (i) share experiences on ecotourism and its relevance to practitioners in field. and (ii) deliberate on issues of setting standards for ecotourism at various levels ranging from high end resorts to community based tourism. It was organised by India Habitat Centre, New Delhi and CMS Environment, New Delhi. The seminar provided a brief picture of important ecotourism initiatives in different parts of India, discussed issues related to its sustainability and finally discussed how certain minimum standards could be set for future ecotourism programmes in India. Dr. A.K. Bhardwaj attended the seminar as a resource person.

Expert workshop on nomination and management of serial and transitional natural heritage sites, Isle of Vilm, Germany, November 3-10, 2009. The workshop aimed at feeding in experiences and further recommendations to the process of developing draft guidance for serial and transnational world heritage. It was organized by the German Federal Agency for Nature Conservation (BfN) with its International Academy for Nature Conservation in collaboration with IUCN.

The expert meeting was a follow-up to the first meeting held in November 2008, bringing together world heritage experts, site managers and committee members to discuss the present situation, challenges and opportunities of Serial Natural World Heritage properties. The workshop had identified various areas where further expertise and guidance are needed. In this meeting, the serial nomination of the Western Ghats from India was presented by Dr. K. Vasudevan as a case study, and its details were discussed.

Training on “Ecotourism and Biodiversity Conservation”, Port Blair, November 9-13, 2009. The

training, organized by Andaman and Nicobar Islands Forests and Plantation Development Corporation Ltd., was sponsored by the Ministry of Environment and Forests, New Delhi. The objectives of the training were to: (i) expose the participants to the concept and application of ecotourism for biodiversity conservation; and (ii) visit and study various ecotourism initiatives undertaken in the Andaman Islands by the Forest and Wildlife Department.

This training programme comprised a background session about the biodiversity values of the Andaman and Nicobar Islands, various ecotourism initiatives undertaken by the Forest Department and a proposed project of the Tourism Department for promoting ecotourism. This was followed by visits to various ecotourism sites and on the spot studies of these initiatives. On the final day of the training workshop, the issues involved in the ongoing ecotourism programme of the Andamans were discussed and the way forward was brought up for discussion. Dr. A.K. Bhardwaj and Dr. V.K. Melkani attended the training programme.

International workshop on “Training and Capacity Development Programme for World Heritage” in Chexbres, Switzerland, November 10-12, 2009. The Federal Office of the Environment (Natural Heritage Section), Government of Switzerland organized this international workshop. The main objectives of the workshop were to: (i) consult with the principal stakeholders with a view to revising the Global Training and Capacity Development Strategy for World Heritage; (ii) determine an operational framework for integrating training and capacity development for cultural and natural heritage; (iii) clarify the roles and responsibilities of the World Heritage Centre, the Advisory Bodies, and cooperating academic institutional partners with respect to the implementation of the Global Strategy; (iv) propose the outlines of a single 5 year training and capacity development programme for both cultural and natural heritage that would be implemented by the World Heritage Centre, the advisory bodies and cooperating academic institutional partners (i.e., category 2 regional centres of world heritage training and research); and (v) evaluate new and emerging situations to determine the major elements that need to be considered in revising the Global Training and Capacity Development Strategy.

Representatives of UNESCO's advisory bodies, viz., IUCN, ICOMOS and ICCROM, and natural and cultural heritage experts provided professional inputs in the development and implementation of the Global Training Strategy. Dr. V.B. Mathur provided professional inputs in the workshop.

V World Conference on “Mountain Ungulates”, Granada, Spain, November 10-14, 2009. The Regional Ministry of the Environment of the Junta de Andalucía, Spain, Andalusian Institute of Hunting and Inland Fishing, EGMASA and the IUCN/SSC Caprinae Specialist Group organized the V World Conference. The topics of this conference include: knowledge, condition and conservation of wild mountain ungulate populations and threats, genetic isolation, hybridization, tourism, contagious infectious diseases, data collection procedures, and management and capture techniques. Dr. S. Sathyakumar chaired a session and provided technical inputs as a member of the Scientific Committee of the Conference. Shri Tapajit Bhattacharya, Shri Lalit Kumar Sharma, Ms. Samina Amin Charoo, Shri Manish Bhardwaj, Shri Asif Hussain, and Ms. Vasundra Kandpal also participated in this conference and presented papers on various aspects of mountain ungulate research in the Indian Himalaya.

International conference on “Carnivore 2009” – Carnivore conservation in a changing world, Denver, USA, November 15-18, 2009. Carnivore 2009 is an international event organized by the Defenders at Denver, USA. Dr. Bilal Habib participated in this international conference. He presented two papers.

Asian regional meeting and biodiversity informatics workshop, Bangkok, Thailand, November 16-19, 2009. The Asian Regional Meeting and Biodiversity Informatics Workshop were co-organized by the Global Biodiversity Information Facility (GBIF) and the ASEAN Centre for Biodiversity (ACB). Dr. G. Talukdar attended the meeting.

International symposium on “Conservation of the Asiatic Black Bear”, Taipei, Taiwan, November 17-21, 2009. The National Taiwan Normal University, National Pingtung University of Science and Technology, Forestry Bureau, Yushan National Park, Taipei Zoo and Endemic Species Research Institute of Taiwan organized this international symposium. The goal of this symposium was to promote research and conservation of Asiatic black bears by providing a platform for improved communication and information exchange between researchers and conservationists. Dr. S. Sathyakumar participated in this symposium and presented a paper, “Ecological Studies on the Asiatic Black Bear in Dachigam National Park, Kashmir, India”. Shri Lalit Kumar Sharma and Ms. Samina Amin Charoo also participated in this symposium and presented a paper on “Asiatic Black Bear-Human Conflicts Around Dachigam National Park, Kashmir”. They also participated in the field trip to Yushan National Park and the Endemic

Species Research Institute to get an exposure to black bear research and management in Taiwan.

National workshop on “Invertebrate Taxonomy” Vadodara, November 18-19, 2009. MS University, Vadodara organized this national workshop. Dr. V.B. Mathur attended the national workshop and delivered a key note address on “Capacity Building in Taxonomy: Challenges and Way Forward”.

National seminar on “Environmental Degradation and Biodiversity: Problems & Prospects”, Kanpur, November 29-30, 2009. Dr. Pranab Pal participated in this seminar, which was organized by DAV College Kanpur. The seminar was sponsored by the University Grants Commission, New Delhi. The participants focused on the issues of biodiversity conservation, water and energy. More than 300 participants attended the seminar from several parts of the country and abroad. The Hon'ble Minister of State (Independent Charge), Ministry of Coal and Statistics & Programme Implementation, Government of India, Shri Sri Prakash Jaiswal, graced the seminar as the chief guest. Dr. Pal delivered a lecture on “Status and Anthropogenic Disturbances of the Biological Diversity”.

Expert workshop on “Minimizing Environmental Risks and Adapting to Climate Change Through Conservation of Biodiversity: Identifying the Capacity Building Needs in India”, New Delhi, December 2, 2009. Capacity Building International, German Regional Office, New Delhi organized this expert workshop. Dr. V.B. Mathur participated in the brainstorming session.

Environment summit, Dehra Dun, December 2-3, 2009. On the occasion of National Pollution Prevention Day, December 2, 2009 and National Conservation Day, December 3, 2009, CII Uttarakhand organised the “Environment Summit” in partnership with Uttarakhand Council of Science and Technology and Uttarakhand Environment Protection and Pollution Control Board. The conference sessions focused on making Uttarakhand a carbon neutral state; building an organic and green Uttarakhand; making Uttarakhand an organic an herbal state; and conserving water and restoration of the Ganga. The summit was attended by over 200 delegates from government, industry, academia and NGOs. Dr. Asha Rajvanshi participated in the deliberations, particularly on green development options for Uttarakhand.

Carbon sequestration through wood and bamboo products, Bangalore, December 7-8, 2009. Dr. V.K.

Melkani attended the training programme, organized by Indian Plywood Industries Research and Training Institute (IPIRTI), Bangalore.

Workshop on “Orientation Programme on Environmental Laws and Responsible Tourism for Service Providers, New Delhi, December 12-13, 2009.

This workshop was organized and sponsored by WWF-India, New Delhi. The objectives of the workshop were to: (i) raise awareness on responsible/sustainable tourism by drawing on success stories from the field; (ii) research and develop a comprehensive information package on responsible mechanisms, environmental law and policy relating to tourism in India; and (iii) disseminate information and create awareness on the interface between tourism and environmental conservation. The workshop revolved around the issues concerning responsible tourism and conservation of the environment. Various speakers presented case studies of good and sustainable tourism practices in India. Participants were exposed to the policy and legal issues related to responsible tourism and protection of the environment, wildlife and biodiversity. Dr. A.K. Bhardwaj attended the workshop.

International conference and exhibition on “Recent Advances in Environmental Protection” (RAEP) 2009, Agra, December 17-19, 2009. Dr. Pranab Pal participated in this international conference, which was organized by the Department of Chemistry, St. John's College, Agra. It was jointly sponsored by the Board of Research in Nuclear Science (BRNS), Mumbai; Oil and Natural Gas Commission (ONGC), New Delhi; Department of Science and Technology (DST), New Delhi; Council of Scientific and Industrial Research (CSIR), New Delhi and Dr. B.R. Ambedkar University, Agra. More than 550 participants attended the conference from several parts of India and abroad. Dr. Pal presented a paper on “Ecosystem Loss and Its Impacts on Biological Diversity”.

National workshop on “Community-Based Conservation Action Plan for Brown Bear in Nepal”, Pokhara, Nepal, January 21-24, 2010. The Biodiversity Research and Training Forum (BRTF), Nepal organized this workshop in collaboration with the International Bear Association and with funding support from the Rufford Small Grants Programme, UK, British Ecological Society, UK and KNCF, Japan. A total of 81 members participated in this workshop, including 56 representatives from the local communities of the Annapurna and Manasulu areas, officials from the government, subject experts and members

of NGOs. As Co-Chair of the South Asian Brown Bear Expert Team of the IUCN/SSC Bear Specialist Group, Dr. S. Sathyakumar was invited to be the chief guest of this workshop. He presented two papers, viz., “Conservation Action Plan for Brown Bear in India” and “Ecological Studies on the Asiatic Black Bear in India”, and moderated the group discussions.

First Asian Ministerial Conference (AMC) on Tiger Conservation, Hau Hin, Thailand, January 27-30, 2010.

Dr. Y.V. Jhala attended the conference as part of the Indian delegation to provide technical inputs on India's stand and role in the GTI.

Workshop on “Optimum Forest Cover—Strategies for Achieving the National Goal”, Dulapally, Hyderabad, February 22-23, 2010. The workshop was organized by the Centre for Forest and Natural Resource Management Studies, Dulapally, Hyderabad, Andhra Pradesh and sponsored by the Ministry of Environment and Forests, Government of India, New Delhi. The objectives of the workshop were to: (i) understand the existing forest cover of the country and proposed national targets; and (ii) discuss various ways of increasing the forest cover of India.

This workshop had various sessions to understand the existing policy of the government for raising the forest cover of the country and issues involved in implementation of these policies. Based on this information the participants tried to discuss how the existing problems could be mitigated and how the national targets of forest cover could be achieved by involving different stakeholders. Dr. A.K. Bhardwaj attended the workshop.

Scoping workshop on “Developing an EIA Biodiversity Data Publishing Framework in South Africa”, Cape Town, South Africa, March 2-4, 2010.

South African National Biodiversity Institute (SANBI), in partnership with the Global Biodiversity Information Facility (GBIF) and the International Association for Impact Assessors—South Africa (IAIASa) has launched the EIA Biodiversity Data Publishing Framework project. The aim of the project is to capture the biodiversity information contained in the EIA reports and make it available for further use. Dr. Asha Rajvanshi participated in this scoping workshop. This workshop was planned as part of the GBIF strategic plan for EIA biodiversity data capture, management and archival. During the workshop, Dr. Rajvanshi shared the IAIA perspective on mobilization of EIA associated biodiversity data and discussed the various perspectives on the issues and prospects of mobilizing

biodiversity data from EIAs in the context of India. The participation was funded by the Global Biodiversity Information Facility, Copenhagen, Denmark.

Workshop on “Cyber Security and Surveillance”, Dehra Dun, March 10, 2010. The workshop was organized by the Computer Society of India at Doon University, Dehra Dun. Talks and experiences on topics related to cyber security, network security, firewall, security from viruses and spam, and video surveillance were delivered during the day long workshop. There were eminent speakers from NIC, Department of IT, Government of India, New Delhi, other organizations and IT firms from different parts of India. Shri V. Sukumar and Shri Dinesh Singh Pundir attended this workshop.

Training on Google Earth Pro, Dehra Dun, March 13, 2010. WII procured Google Earth Pro software. This software offers powerful tools and features for professional and commercial use which are not available in the free version of Google Earth. Although the imagery is the same in both products, they are distinguishable by their functionality. Messrs. D-cad, New Delhi, an authorized Google Training Centre in India, conducted one-day training on Google Earth Pro at WII. It was attended by Shri G.S. Bhardwaj, Dr. Gautam Talukdar, Dr. Bilal Habib, Shri Rajesh Thapa, Dr. Panna Lal, Dr. Manoj Agarwal and Smt. Alka Aggarwal.

International conference on “Mountain Biodiversity Conservation and Sustainable Utilization”, Dehra Dun, March 13-15, 2010. This conference, held at Doon University, was sponsored by the Uttarakhand Science, Education and Research Centre (USERC); Department of Science and Technology (DST); and Council of Scientific and Industrial Research (CSIR). A total of 100 participants took part in the conference and discussed various aspects of mountain biodiversity; below ground microbial diversity; below ground faunal diversity; conservation of faunal diversity; ethno-botany and traditional knowledge; utilization of medicinal plants, NWFPs and bio-prospecting; geomatics in biodiversity conservation; and climate change and carbon sequestration. Shri Ashwini Kumar Upadhyay presented a paper titled “Conservation Status, and Distribution of Wild Ungulates in Changchenmo Valley, Eastern Ladakh”.

Training in data entry using software for All India Tiger Estimation, Hyderabad, March 18, 2010. This was organized by the Andhra Pradesh State Forest Department and WII. Dr. Bilal Habib and Dr. G. Talukdar

attended the training programme as resource persons. A total of 50 participants participated in the training programme.

Training in data entry using software for All India Tiger Estimation, Nagpur, March 20, 2010. This training was organized by the Maharashtra State Forest Department and WII. A total of 65 participants participated in the training programme. Dr. Bilal Habib and Dr. G. Talukdar attended the training and provided their inputs.

First multidisciplinary committee meeting of the Teesta Stage VI HE Project, Gangtok, Sikkim, March 22, 2010. As a member of the multidisciplinary committee constituted by the Ministry of Environment and Forests, Government of India, Dr. S. Sathyakumar participated in the meeting and provided technical inputs during discussions and field visits.

Regional training on “Biodiversity Management and Climate Change”, Kathmandu, Nepal, March 22-31, 2010. This training was organized by ICIMOD, Kathmandu, Nepal. The training was intended for ICIMOD's “Conservation Landscape Initiatives in the Hindu Kush Himalayan Region”. The partners from the Kanchenjunga Landscape (Bhutan-India-Nepal), Kailash Sacred Conservation Landscape (China-India-Nepal) and Brahmaputra Salween Landscape (China-India-Myanmar) attended the training course to understand the inter-linkages between biodiversity and climate change. The participants were exposed to the challenges and prospects of biodiversity management, the use of biodiversity assessment techniques and tools in the context of climate change and international, regional and national policy developments. Dr. B.S. Adhikari attended the regional training.

6th State of the Planet Conference, March 25-26, 2010. A total of 12 participants including students, researchers and faculty members from WII participated in this web-conference. The conference had four major sessions: (a) Climate change; (b) Poverty; (c) Economic Recovery; and (d) International Systems to Deal With Transnational Issues. India was one of the leading participants, and TERI, New Delhi was one of the host sites for the session on climate change.

The discussion on “Climate Change” was attended by delegates from New Delhi. India came up with the idea of innovating eco-friendly technologies for addressing current climate change concerns. Shri Nitin Desai, Former UN

Under-Secretary-General from TERI emphasized the need for enforcement of international agreement. Prince Albert II of Monaco, Princess Máxima of the Netherlands, President Felipe Calderón Hinojosa, United Mexican States were among the dignitaries who participated in the conference. Mr. Ban Ki Moon, UN Secretary-General also addressed this conference. Possible ways and means of mitigation of the effects of climate change, improving the economic growth rate of nations and challenges of poverty were explored, and international commitment with action was stressed by all to address the current global issues. The conference was successfully hosted by the Earth Institute, Columbia University, US.

First consultative stakeholders workshop on “Recovery of Hangul in Kashmir”, Kashmir, J&K, March 27, 2010. The Department of Wildlife Protection, J&K, in technical collaboration with WII and the Wildlife Trust of India, conducted the workshop at Dachigam National Park, Kashmir. Representatives of all the government line departments, universities, NGOs, industries and local communities participated in this workshop to develop a road map for the recovery of the hangul in J&K state. Dr. S. Sathyakumar participated in this workshop and presented the Conservation Action Plan for Hangul, approved by the government, and moderated the group discussions.



Vinod Verma

professional support

Collaborations

EIA

Computer & GIS

National Wildlife Database

Wildlife Forensic

Wildlife Extension & Audio Visual

Library and Documentation Centre

ENVIS

Research Laboratory

Herbarium

Wildlife Health Services

Conservation Genetics Laboratory

Campus Development

Collaborations

Professionalizing Protected Area Management for the 21st Century – A World Heritage Biodiversity Programme for India

The United Nations Educational, Scientific and Cultural Organization (UNESCO), in collaboration with the United Nations Foundation (UNF), had given a planning grant in 2001 to the Ministry of Environment and Forests (MoEF), Government of India, to develop a 10-year World Heritage Biodiversity Programme (WHBP) for India. The goal of this WHBP is to strengthen biodiversity conservation in protected areas by building replicable models at World Heritage Sites that emphasize law enforcement, promote habitat integrity and connectivity and improve the professional, social and political profile of the protected area management community and its civil society partners. The MoEF entrusted the responsibility of developing a framework proposal for identifying priorities, actions and activities and their time frame and budget requirement under this project jointly to WII and the Ashoka Trust for Research in Ecology and Environment (ATREE), Bangalore. The WHBP proposal was discussed and finalized in consultation with representatives from UN Foundation, UNESCO, Ford Foundation and ATREE. The UN Foundation and its partners have agreed to provide funds amounting to US\$1.83 million for the 4-year implementation phase of the WHBPI.

During the reporting period, a range of activities under the project “Building Partnerships to Support UNESCO's World Heritage Programme: India” were carried out in all four pilot sites, viz., Keoladeo National Park, Rajasthan; Nanda

Devi National Park, Uttarakhand; Kaziranga National Park, Assam; and Manas Wildlife Sanctuary, Assam. The responsibilities for implementation of the project activities in Keoladeo and Nanda Devi National Parks were assigned to WII and to ATREE, Bangalore for Kaziranga and Manas. Field equipment/gear was provided to the park staff, and livelihood enhancement activities were taken up at the project sites. Several thematic workshops were conducted to build the capacity of the frontline staff. The rickshaw pullers-cum-guides at Keoladeo National Park were given courses in the French and German languages. An aerial monitoring in Nanda Devi WHS was carried out to identify vulnerable areas and to plan anti-poaching strategies. The project activities were reviewed in the Project Steering Committee meetings chaired by the Additional Director General (WL). The project is coordinated by Dr. V.B. Mathur.

Student Conference on Conservation Science (SCCS), Bangalore, June 16-18, 2010.

A consortium of conservation organizations decided to organize the first student conference on conservation science. The main goals of the conference were to provide a forum for young conservation scientists to build scientific, analytical and communication skills; facilitate interaction between young conservation scientists from the widest possible background, research fields, and geographical areas; and to bring young conservation scientists in touch with established scientists and practitioners from all manner of organizations including government, NGOs, and academia in order to make them familiar with opportunities for further research and employment in the field of conservation. Dr. V.B. Mathur served on the SCCS Advisory Committee, especially to review the application for funding support to the participants.

Re-introduction of Tigers in Panna Tiger Reserve, Madhya Pradesh

Wildlife Institute of India is supporting the efforts of the Madhya Pradesh Government and the National Tiger Conservation Authority to re-establish a tiger population in Panna Tiger Reserve (TR), following the extinction of tigers in the reserve in February 2009. Three tigers have been introduced in Panna TR (two female and one male), and the female translocated from Bandhavgarh Tiger Reserve gave birth to four cubs in April 2009, reflecting the success of the tiger reintroduction effort for the first time in India. Shri



Qamar Qureshi, Shri S. Sen and Dr. K. Ramesh were involved in identifying the candidate animals for this effort. Dr. Parag Nigam helped in chemical immobilization, and Dr. P.K. Malik provided further technical inputs. Dr. K. Ramesh contributed to the Species Recovery Plan and coordinates the post-release monitoring of these animals, and a research project is being carried out by a team of faculty members and research fellows to address various scientific and conservation issues. The efforts offer a unique opportunity to strengthen the technical expertise to secure the future for tigers in India.

IUCN Scoping Mission to ACC Gagal Plant, Himachal Pradesh

The Associated Cement Company (ACC) has set up a cement plant in Barmana (Gagal), Bilaspur, Himachal Pradesh, which is the largest producer of cement in the country. Holcim Ltd. Switzerland, one of the world's leading suppliers of cement and aggregates (crushed stone, sand and gravel), has taken over ACC in 2005, and it has entered into a partnership with IUCN to advance their environmental commitments. Looking at the potential engagement of the private sector in biodiversity conservation, IUCN undertook a scoping mission to the plant at Gagal during June 22-27, 2009. The primary objective of the mission was to take stock of the biodiversity conservation activities taken up by the ACC management and to offer a strategic plan to showcase this to be their best model, to be replicated by other ACC plants in the country. WII, being a member organization of IUCN, responded positively to the invitation from IUCN to be represented in the mission. Dr. K. Ramesh participated and provided inputs on the biodiversity issues, including developing strategic proposals for assessing the biodiversity value and capacity building for biodiversity monitoring.

Services

Asian Development Bank (ADB) Technical Assistance (TA) for the "India Inclusive Tourism Infrastructure Development Project"

The Asian Development Bank (ADB) approved technical assistance (TA) for the "India Inclusive Tourism Infrastructure Development Project" in December 2007. The expected outcome and output of the TA was an agreed design for a feasible tourism infrastructure development project that will contribute to the accomplishment of the Government of India's objectives of: (i) integrated development of high-priority tourism infrastructure in high-potential tourism circuits focusing on nature and culture based tourism in selected states, resulting in enhanced connectivity and improved environment, utilities,

and tourist services; and (ii) improvement of institutional and regulatory frameworks that will ensure coordinated efforts of multiple agencies, promote environmentally and culturally sustainable and socially inclusive tourism development and encourage private sector and community participation in tourism. The TA included an assessment of the feasibility and preparation of an investment package for four states of India, namely Tamil Nadu, Himachal Pradesh, Punjab and Uttarakhand, for possible ADB financing. As part of the TA implementation process, the ADB formed an expert panel to review and provide inputs on the key outputs of the TA, mainly the interim and draft final reports. The services of Dr. V.B. Mathur were engaged by the ADB to provide inputs in the area of natural heritage and resource protection and management in the context of nature-based tourism components of the proposed project. Dr. Mathur submitted an interim report on "Review of Project Impacts on Natural Heritage and Resource Protection and Management in the Context of Nature-Based Tourism" during the reporting period.

Evaluation of World Heritage Nomination of the Central Highlands of Sri Lanka

The IUCN—The World Conservation Union engaged the services of Dr. V.B. Mathur as the IUCN Field Evaluator for the World Heritage nomination of the Central Highlands of Sri Lanka during September 23–October 1, 2009. The nomination had been put forward by the Government of Sri Lanka as a mixed cultural and natural property, and the mission was carried out in conjunction with ICOMOS. Based on a desk review and field visit, Dr. Mathur submitted the evaluation report "The Central Highlands of Sri Lanka: Its Cultural and Natural Heritage" to IUCN for the consideration of the UNESCO World Heritage Committee.

Global Biodiversity Information Facility (GBIF)

In August 2009, all work relating to GBIF-India was transferred to the MoEF, and attempts are being made by the MoEF to activate the involvement of GBIF-India Nodes. The first meeting of GBIF India Nodes was held on January 12, 2010 in New Delhi, under the chairmanship of Shri A.K. Goyal, Joint Secretary, MoEF. This meeting was a step to involve GBIF Nodes in matters relating to the preparation of the biodiversity database and India's association with GBIF. Towards this, the MoEF designated WII as the overall GBIF-India Coordinating Node and the Zoological Survey of India (ZSI), Botanical Survey of India (BSI), Foundation for Revitalisation of Local Health Traditions (FRLHT) and National Biodiversity Authority (NBA) were designated as thematic nodes. The thematic nodes identified above will serve as the information nodes to coordinate and

collaborate with other organizations that generate data on these areas, such as universities, and will collect and authenticate standardized data to compile databases on selected thrust areas. Each node will designate a Nodal Officer in its respective institutions and facilitate the above activities.

Preparation of Management plan for Asan Conservation Reserve, Uttarakhand

The Asan Conservation Reserve (ACR) primarily comprises a freshwater wetland system at the confluence of the Asan River with the Yamuna near village Dhalipur in Dehra Dun district. Altogether, 250 species of birds have been reported from the reserve. Nine of them were threatened species and seven were near-threatened bird species. WII was given the responsibility of preparing a management plan of the reserve in December 2007. The planning process started thereafter, and the draft plan was submitted to the Chief Wildlife Warden and the management committee of the reserve in March 2009. After comments from them were incorporated the final plan was submitted in December 2009. The plan period is from 2009-2010 to 2013-2014. Simple and achievable objectives were set for the management of Asan Conservation Reserve. The objectives were to: (i) maintain of ecological functions and biodiversity values in the conservation reserve; (ii) strengthen mutually beneficial involvement of local people and other stakeholders in reserve management; (iii) promote eco-friendly tourism that provides a rich experience for tourists, economic benefits to the local people and support to the reserve; and (iv) develop the reserve as a centre for conservation education and professional learning.

In general, a policy of minimal intervention in natural biological processes has been followed in the management plan considering the fragility of the wetland ecosystem. The management initiatives proposed in this plan have also been suitably oriented to follow this policy. A number of strategies have been suggested to garner the support of the three villages that lie in the vicinity of the ACR. For the long-term sustainability of the programme, it was proposed that a reserve level trust named Asan Conservation Trust (ACT) be constituted as a part of the institution building process. The trust will support and facilitate conservation related activities of the ACR and the programmes of EDCs. In addition, the trust will also be responsible for the research and monitoring, training, and conservation awareness programmes of the areas. Protocols for monitoring have been suggested in the plan, and priority research areas have been identified.

Asan being a potential Ramsar site, the procedure and supporting information to get it listed as a Ramsar site have been provided in the chapter. The financial outlay for execution of the plan has also been worked out and presented in the plan.

USDA Forest Service (USFS)

A full proposal entitled "Landscape Genetics of the Indian One-Horned Rhinoceros for Managing Viable Populations in the Brahmaputra River Valley" was developed by Dr. P.K. Mathur and Dr. S.P. Goyal of WII in collaboration with Dr. John F. Lehmkuhl of USFS and Dr. L. Waites of the University of Idaho, USA during the reporting period, and the proposal was submitted to the International Rhino Foundation (IRF) for funding. Dr. John F. Lehmkuhl, Dr. Alan Ager and Dr. Vicky Erikson, scientists from the Pacific North Western Station, USFS visited WII during March 28-April 3, 2010 and provided inputs to the ongoing XXXI Diploma course during their Remote Sensing and GIS Module. Their visit facilitated development of a tour itinerary, coordination and explore possibilities of future collaboration. Efforts were also made to publish previous collaborative research work jointly undertaken with the US collaborators.

Environmental Impact Assessment (EIA)

The Environmental Impact Assessment Cell of WII continued to provide professional support to the capacity building initiatives at WII, sister organizations, other institutions, professional bodies and government and corporate organizations. Networking and collaborations with international agencies also continued to expand and diversify.

Professional Support to Other Organisations

Professional support to the Indian Road Congress (2009–2011): Dr. Asha Rajvanshi served as a member of the Environment Committee (G-3) of the Indian Roads Congress, which is a premier technical body for ensuring environmental conservation and sustainable development of highway projects in India. In this capacity, she continued to provide professional support through membership to the Committee of Environment of Indian Road Congress and undertook (i) a review of the guidelines for biodiversity sensitive planning of roads and highways and (ii) a review of the manual on landscaping and trees.

Professional support to Quality Council of India's National Registration Board for Personnel and Training: As part of the ongoing initiative of the MoEF for revision of the

environmental clearance process, the Quality Council of India (QCI) initiated the development of a registration scheme for EIA consultants through the National Registration Board for Personnel and Training (NRBPT). The QCI invited Dr. Asha Rajvanshi to become a member of the Technical Committee for providing advisory support in the development of various criteria for EIA consultant organizations for NRBPT registration. Dr. Rajvanshi provided professional support to QCI in standardizing the criteria for assessment of EIA reports and contributed in several consultative meetings organized during the reporting year.

Professional support to IAIA: The International Association for Impact Assessment (IAIA) is an interdisciplinary, non-profit professional society. This professional body is the leading global authority for advancing innovations and communication of best practices in all forms of impact assessment. Dr. Asha Rajvanshi and Dr. V.B. Mathur have been members of this association for a long time. Dr. Rajvanshi continued to be the Chair of its Biodiversity Section.

Professional support to Environmental Protection Agency, Ghana: The Environmental Protection Agency (EPA), under the Environmental Assessment Capacity Development Programme (GEACaP) and the Ghana Environmental Assessment Support Project, initiated and completed the development of Environmental Assessment Sector Specific Guidelines for eight sectors, namely Transportation, Mining (revision), Tourism, General Construction & Services, Energy, Manufacturing, Agriculture and Health. The key objective of the exercise was to provide tailored guidance for the conduct of environmental assessments in specific sectors. The Executive Director, EPA, who is also the President of IAIA, invited Dr. Asha Rajvanshi and Dr. V.B. Mathur, as members of the IAIA professional network, to review the guidelines. The work involved a desktop review of guidance documents and submissions of the revised guidelines to EPA, Ghana. In recognition of the contributions of these two faculty members in this collaborative work, EPA provided partial funding support to them for attending the IAIA meeting at Accra, Ghana.

Collaboration with Global Biodiversity Information Facility (GBIF) for EIA Biodiversity mobilization: Considering that most biodiversity data collected during impact assessment (IA) are gathered “once-off” and lost after that project is finished, the merits of providing a means to capture and mobilize biodiversity related EIA data was discussed at the first meeting of the Indian nodes of GBIF that was held on January 12, 2010 in the MoEF, under the chairmanship of the Joint Secretary, MoEF. It was agreed that a pilot project for

mobilization of EIA Biodiversity on the lines of the South African National Biodiversity Institute (SANBI) pilot project should also be considered under the inter-organizational partnership between India and GBIF. Accordingly, a proposal for initiating an Indian pilot project for developing an EIA biodiversity data publishing framework was put up for the approval of the MoEF and subsequently for the consideration of GBIF for supporting this initiative. A memorandum of understanding between GBIF and WII was signed in March, 2010 for the implementation of the Indian pilot project.

Advisory support to National Board for Wildlife: In response to the directive of the MoEF, following the discussions at the 16th meeting of the Standing Committee of NWL, on issues pertaining to the siting of the 2640 MW Bhanvnapadu Thermal Project in Andhra Pradesh, it was decided that a team comprising Dr. Asad Rahmani, Director, BNHS and Dr. Asha Rajvanshi would carry out a site visit for appraisal of the impacts of the above thermal project on the wetland value of Naupada swamp. Accordingly, Dr. Rajvanshi undertook a joint appraisal of the site with Dr. Asad Rahmani and submitted a report to the MoEF.

Advisory support to MoEF: WII continued to provide advisory services to the MoEF on matters related to environmental decision making. Some of the members of the WII faculty are on the Environmental Appraisal Committees (EACs), MoEF, Government of India, including the EAC for mining projects and for thermal power and coal projects. Dr. Rajvanshi provided advisory support as a member of the Expert Committee (Thermal and Coal Projects). As a member of the sub-group of the Expert Committee for Thermal and Coal Projects, Dr. Rajvanshi undertook site appraisal of the proposed 1320 MW thermal power plant site in Devla village and of the 4×660 MW thermal power plant of Adani Power Dahej Limited (APDL) in Dahej, Bharuch district, during June 9-10, 2009.

As an expert committee member of the EAC (Mine), Dr. B.K. Mishra helped the Impact Assessment Agency of the Government of India in appraisal of proposals sent for grant of environmental clearance. He scrutinized on an average 8 to 10 projects for environmental clearance and 12 to 15 TORs every month. In many cases he suggested mitigation measures for development of environmental conservation plans.

Development of Mitigative Measures for Wild Animal Movement Across Madhya Ganga Canal Aligned Through Hastinapur Wildlife Sanctuary
Funding source: Madhya Ganga Canal Division, U.P. Irrigation Department, Bijnore

Objectives: This short-term study was initiated with the objectives to: (i) assess the habitat use by wild animal species in the area proposed for construction of the main canal through the Hastinapur Wildlife Sanctuary; and (ii) suggest measures to ensure wild animal movement across the canal, specifically the location, number and design of structures for crossing over.

Progress: After an initial reconnaissance to get a snapshot of the area for prioritizing areas of ecological importance within a 44 km length of canal route aligned within the sanctuary, a detailed survey was undertaken to assign relative importance to different sites along the canal corridor. At each linkage point (chainage point), information about the land use pattern and wildlife value was collected. The faunal diversity was estimated using direct and indirect evidence (pellets, droppings, scats, animal tracks and signs) along forest roads, human paths and river beds as a part of the intensive field studies. Estimation of the existing levels of biotic pressures was made to assess the nature of existing threats to the wildlife value of the terrestrial habitats. In addition, consultations with the local people were organized to assess the presence or absence of wild animal species in the area. The information received from local people was validated during the course of the survey.

Output: The data collected during the field survey were analysed, and the following primary and secondary impacts were predicted: (i) drowning or entrapment of animals inside the canal; (ii) increase in human-animal conflict; (iii) increased threats to conservation prospects of the wildlife value of the protected area; and (iv) increased threat of mortality or injury to wild animals due to construction of the canal inspection road.

In order to review the effectiveness of various mitigation options in addressing the range of impacts associated with the canal development, scenario building was attempted with a clear focus on choosing the option that offers the greatest merits for strengthening wildlife conservation efforts in a post-project scenario. The study highlighted the importance of improving the habitat potential of stressed habitats to buffer the protected area from anthropogenic influences so that the faunal elements can be contained within the PA. This will obviously reduce the risk of animals straying out and getting drowned. This form of mitigation is aimed to provide an appropriate fit within the physical landscape and to build upon the existing landscape character by extending the habitat area by addition of “reconstructed habitats” in areas currently under agriculture. Such an approach would not only offset the impacts of the construction of the proposed irrigation canal

but also enhance and upgrade the conservation value of the wildlife sanctuary by providing extended habitats for the wild animals.

Environmental Impact Assessment Study on Flora and Fauna in the Narmada Canal Project (NCP) Areas in Rajasthan

Funding source: Govt. of Rajasthan

Objectives: The objectives of the project are to: (i) assess key floral and faunal attributes in the proposed command area of NCP in Rajasthan; (ii) inventorize floral resources of medicinal and forage value; (iii) identify impacts on key flora and fauna on account of construction of canals, and water flows in the canal system and drains, including those due to practicing irrigated agriculture; and (iv) suggest mitigation/management, including a monitoring plan, to minimize adverse impacts on key floral and faunal attributes.

Progress: The fieldwork, involving a reconnaissance survey and intensive field sampling, was carried out in the command area of the Narmada canal during the months of winter. The study area within the command area of the canal was divided into five different land categories based on the levels of irrigation proposed and intensity of agricultural activities. A total of 33 line transects were laid in these categories to assess floral and faunal attributes. An effort was made to record animal absence/presence, diversity and encounter rate through direct and indirect observations (pellets, droppings, scats, animal tracks and signs) in the study area. For estimating the tree and shrub density, sampling was done at every 250 m using the point-centred quarter method and circular plots, respectively. Data were also specially generated on the abundance of the Indian gazelle in various categories of land to assess the impacts of changes likely to be brought about in its habitat on account of irrigation induced changes in productivity and cropping patterns. Additional information was collected on existing land use; cropping patterns and intensity; and the people's response to improved irrigation inputs.

Outputs: A checklist of plants, mammals, birds and reptiles found in the command area of the canal is being prepared. Data are being analysed to determine the abundance of the Indian gazelle and nilgai in land of various categories. Preliminary findings reveal that the frequency of encounter of the Indian gazelle was highest in “economically non-irrigable land (category D)”, followed by “*gochar bhoomi* or grazing areas (category E)”, whereas in the case of the nilgai, the frequency of encounter was highest in *gochar bhoomi* (category E), followed by that in “moderately irrigable land

(category A)". For both the Indian gazelle and nilgai, the largest group size has been found in *gochar bhoomi* (category E).

The results of the study will help assess how the Narmada canal project will modify the hydrological balance, ecological character of the area and productive potential of the land, which directly or indirectly may affect the wildlife species present in that area. A well conceived mitigation plan will be prepared to maximize the benefits of development the canal for people and to mitigate the impacts on the wildlife of the region.

Computer & GIS

The Computer & GIS facility is the backbone of WII for providing cutting edge technology relevant to wildlife research, education and training. The facility is available at all times to the faculty members, trainees, researchers, students and collaborators working with WII. A large number of desktop computers configured with updated operating systems and specialized analytical software for data processing and research purposes have been made available at the dedicated lab. The computer facility is equipped with a wide array of hardware connected to a local area network (LAN). There are Intel Pentium Xeon/Itanium servers for Internet, Intranet, database management and library automation services; workstations; a storage area network (SAN) and more than 250 nodes. WII has a leased line connectivity of 2 Mbps. Wi-Fi connectivity has also been provided almost throughout the campus. All the computers of WII are provided with Internet and mailing services. WII is set on the path of e-governance for improved efficiency.

The state-of-the-art Geoinformatics Laboratory, with geographic information system, remote sensing and global positioning system (GPS) technologies at WII caters to the research and training programmes of WII and also to demands from field managers. The laboratory is equipped



with the latest software, such as Idrisi, ArcGIS and ERDAS Imagine, and there are several other spatial analysis tools for modelling species distribution and niche requirements, landscape change detection, etc. A dedicated team is available for providing support and training in IT and geoinformatics. A module on Remote Sensing and GIS is conducted for the M.Sc., PG Diploma and Certificate Courses at WII, and hands-on training is also provided to other graduate students and interns. Work is in progress for the development of the National Wildlife Spatial Database.

Re-engineered WII website: WII's re-engineered website, <http://www.wii.gov.in>, was launched by Dr. Montek Singh Ahluwalia, Hon'ble Deputy Chairman, Planning Commission, Government of India on August 10, 2009.

Geoinformatics in research projects: Geoinformatics technology is being used in most of the research projects of WII for wildlife research and conservation. Work is in progress on the development of a spatial database on the boundaries of all the national parks and wildlife sanctuaries in the country. Similarly, digitization of the divisions, ranges and beat boundaries of 17 tiger range states in the country is in progress. Country level data on the climate, vegetation, topography and animal distribution are also being digitized.

National Wildlife Database

The objectives of the computer-based National Wildlife Database are to: (i) provide readily accessible and comprehensive information on the conservation status of biogeographic regions, habitat types, individual animal species and the network of protected areas in the country; (ii) establish linkages with researchers, protected area managers and planners and with other data centres; and (iii) facilitate research and training activities in wildlife science by providing bibliographic references on protected areas, habitat types and animal species.

Reviewing the Protected Area Network Report was the main thrust of the activities besides regular updation of the databases by incorporating new information gathered during the said period. The state summaries of the Protected Area Network Report have been revised by incorporating the latest information received from various states. The Protected Area Database of India has been updated, and presently there are 662 protected areas including 99 national parks, 515 wildlife sanctuaries, four community reserves and 44 conservation reserves in the country, covering 158,509 km², which is 4.83% of the total geographical area of the country. The Species Database was corrected and updated by adding information on the distribution of

mammalian species in various protected areas. The Bibliographic Database was updated by addition of current publications on Indian wildlife in the various issues of journals/periodicals received during the said period. The Trainees Database has been updated further. The website of the Database Cell has been modified and updated further by incorporating the latest information. Nearly 200 queries were received relating to wildlife database, and outputs were provided in the desired formats.

Wildlife Forensic (WFC)

The WFC's mandates are to undertake research and development of the various techniques needed to identify various parts and products encountered in the illegal wildlife trade in India. Besides, the facility also provides scientific opinions in dealing with wildlife offence cases of different enforcement agencies. During the reported period, 233 wildlife offence cases were referred to the WFC for identification of species from seized biological parts and products. The majority of the cases were of meat (42%) and skins (16.0%), whereas other items were of canine origin, claws, ivory.

During the current year a total of 254 cases were analysed and reports were sent to the concerned enforcement agencies. Of these, 56% of the cases were from forest departments.

Our analysis of the data on the cases (n=946) referred to WII indicates that in ca. 62% of the cases morphometry based techniques can be used for identification. A few cases (1.5%) were returned as the items involved snake poison, body fat and others for which we did not have protocols in place.

Dealing with wildlife offences using morphometry based examination: On the basis of various morphometric techniques, the cell provided reports in 143 wildlife offence cases to different enforcement agencies, and most of the

cases involved skins, shawls, bones and paint brushes.

Dealing with wildlife offences on the basis of DNA techniques: Wildlife items (including meat, blood stains, small bones, skin, bile, hairs etc.) which could not be identified based on morphometry are taken for species identification using DNA based techniques. The cell identified species based DNA sequences of commonly used mitochondrial DNA (mtDNA) genes and compared them with known reference samples. Reports were provided on species identification based on DNA techniques in 111 wildlife offences.

One of the major constraints in dealing with wildlife offences using DNA techniques is a lack of DNA profiles of species. Therefore, there is a dire need to generate DNA barcoding of Indian species and make data compatible with the information generated in other parts of the world. In this respect, a research project has been prepared to initiate this activity. Additionally, DNA techniques have also been used to establish links with the crime scene based on individual identity or, in a few cases, to determine the sex of species.

A fast emerging dimension in dealing with wildlife offences is tracking poaching to its geographic origin. Thus, there is a need to address this issue in India for five species, viz., the tiger, elephant, bears, musk deer and elephant, which are in high demand in the international illegal wildlife trade. WII has already initiated work on the tiger to generate standardized genotyping data across its range in India so as to use them to track poaching cases.

During the reporting period, two small ivory pieces of the Asian elephant (*Elephas maximus*) were forwarded to WII to identify whether both the pieces belong to the same individual. A panel of 12 fluorescent labeled microsatellite loci was used to evaluate the ivory pieces by DNA fingerprinting. After a comparison of all the loci, the DNA typing indicated that in both ivory pieces, the alleles were the same wherever tested. It was concluded that the ivory pieces had the same genotype and hence are derived from the same individual.

Another constraint in dealing with wildlife offences using DNA based techniques is a lack of proper preservation of biological samples for such analysis. Samples involved in 23 wildlife offences were not properly preserved by the enforcement agencies, who were provided with protocols for proper sample preservation. WII has developed a sample collection kit in collaboration with TRAFFIC-India, and this has been distributed in different states.

Apart from performing analysis and providing scientific



opinion, officers from the WFC appeared as “Scientific Experts” in around 45 appearances at Delhi, Khatima, Uttarakhand, Allahabad, Ghaziabad, Chandigarh, Bilaspur, Chattisgarh, etc.

The cell has been providing inputs in a sensitization programme undertaken to control the illegal trade in India for different enforcement agencies, other Forestry organizations and TRAFFIC-India. For the first time, a one-week hands-on training workshop was organized at Gujarat Forensic Science Laboratory, Gandhi Nagar in February 2010 in collaboration with TRAFFIC-INDIA and the Directorate of Forensic Science, Gujarat. Senior forest officers from tiger areas participated in this workshop.

To disseminate the knowledge acquired through research and development work undertaken in the WFC, two reference manuals, titled “Species Identification from Guard Hair of Selected Indian Mammals” and “Tibetan Antelope Illegal Trade and Wildlife Forensic Techniques to Identify Shahtoosh Wool and Shawls” have been uploaded on WII's website (www.wii.gov.in), and CDs are also available on request from WII.

Wildlife Extension & Audio Visual

As part of the outreach programme, WII celebrated World Environment Day on June 5, 2009. The theme for World Environment Day 2009 was “Your Planet Needs You – Unite to Combat Climate Change”, as declared by the United Nations Environment Programme (UNEP). Activities were organized for school children at a summer camp at Vaishnavi International School, and at Galaxian International School, Dehra Dun by WII on this day: (i) a puppet show; (ii) a drawing and painting competition; and (iii) a paper craftwork event. More than 200 children participated in these activities.

Wildlife Week was celebrated at WII. The following activities were organized during the week. (i) Puppet shows were organized at Galaxian International School and DSKS School, Dehra Dun; (ii) A drawing and painting competition was organized at WII's campus for children from four schools. More than 125 children participated in the competition. (iii) Students of Galaxian International School were taken to Malsi Deer Park for an educational visit. (iv) A wildlife quiz was also conducted by WII in collaboration with Friends of Doon, Dehra Dun for the school children of Dehra Dun on October 7, 2009. The teams from Welham Girls School, Hilton's School and Ann Mary School bagged the first, second and third prizes, respectively. Shri S.K. Mukherjee, former Director, WII presented the WII-FoD Trophy to Welham Girls School and distributed prizes to the



winning teams.

The cell provides audio visual support for all teaching and training programmes besides workshops and seminars organized at WII and in the field. Video show of the program titled “We are nature, nature is our world” is screened for visiting classes. During the reporting year 41 shows were screened. The cell also caters to the requirement of the Ministry of Environment & Forests, for photographs of wild plants and animals for publications.

As part of the information dissemination programme, four issues of WII newsletter were published.

WII participated in an international exhibition on “Climate Change: Technology Development and Transfer” held at New Delhi during October 22-23, 2009. The exhibition was inaugurated by Shri Pranab Mukherjee, Minister of Finance, Government of India at Vigyan Bhawan, New Delhi. Shri Jairam Ramesh, Minister of State (Independent Charge), Environment and Forests, Government of India was also present on this occasion. The exhibition was jointly organized by the Ministry of Environment and Forests and Confederation of Indian Industry. WII showcased its activities, with emphasis on climate change. WII also participated in “APOGEE 10”, which was organized by BITS Pilani during March 9-13, 2010 at Pilani.



Library & Documentation Centre

The Library & Documentation Centre (L&DC) plays a vital role in dissemination of information to target scientists of research and training organizations. Therefore, the L&DC is considered the backbone of any research institution. This is the case with WII's L&DC. It was established in line with WII's mission as a multidisciplinary information and learning resource centre on biodiversity conservation and management. The L&DC has the following objectives: (i) to serve as a repository of all the wildlife related literature published in India; (ii) to acquire, organize and disseminate all the relevant worldwide literature on biodiversity conservation and related fields; (iii) to serve the user readership through normal and special library and information services, such as circulation, providing references, photocopying and documentation; (iv) to establish and maintain links with other national information systems in India and other countries to ensure a free flow of information at the national and international levels; (v) to serve as a training centre for information personnel and users; (vi) to provide the above services to WII, protected areas all over the country, institutions engaged in nature conservation research in the country and abroad, universities and colleges, individual scholars working in related areas and NGOs; and (vii) to bring out periodic publications with the current content of periodicals, research in progress, lists of unpublished research literature, including dissertations, thesis, etc., compilations of bibliographies and compilations of abstracts.

The L&DC now holds over 26,622 books, 23,868 newspaper clippings, 7355 maps/toposheets and more than 6459 bound volumes of old and rare journals. The library also maintains a good collection of around 10,500 scientific papers. It subscribes to more than 425 print and online journals. During the reporting period, 272 books, proceedings, theses and reports, 150 scientific papers and 1522 press clippings have been added to the library's collection. The L&DC is



fully computerized, using the LIBSYS library management software, UNESCO'S WINISIS software, a CD server and barcode and related technologies.

For optimum resource use by researchers, students, officer trainees and other users, 10 computer terminals available in the library premises and the faculty desks have been interconnected in a LAN. Being connected to the library facility, the users are privileged to access all in-house databases and books, reprints, Indian wildlife abstracts, the map/toposheet collection and press clippings, as well as the specialized bibliographic databases on the musk deer, application of telemetry in wildlife, wildlife and protected area management in Madhya Pradesh, mountain ungulates, rainforest conservation in India, ungulates of India, Rajaji National Park, galliformes of India and freshwater turtles of India. Users also have access to online databases such as Wildlife and Ecology Studies Worldwide 1935-2009. The L&DC provides a variety of library and information services to its users.

During 2009-2010, over 7546 pages of photocopies were provided to the users. Approximately 45,000 documents were issued and consulted during 2009-2010. The Value Added Service was provided to 250 clients, and the Ready Reference Service was provided to approximately 4200 clients. Approximately 500 queries from outside users were attended to and more than 8000 bibliographic references were provided to the users.

ENVIS Centre on Wildlife and Protected Areas

The Ministry of Environment and Forests, Government of India established the 23rd centre of the Environment Information System in September 1997 at WII. The thematic area of the WII ENVIS Centre is "Wildlife and Protected Areas". The mission of ENVIS is to support and facilitate a diverse group of clientele from policy makers to researchers and industries and promote national and international level cooperation and exchange of environmental data and information through a nation-wide network. The goals of the WII-ENVIS Centre are to: (i) build up a repository and act as a dissemination centre for information on wildlife sciences; (ii) provide information for decision-making at the apex level relating to conservation and development; (iii) establish a database on the protected area network in India; and (iv) promote national and international co-operation through networking and exchange of wildlife related information.

During the reporting period, the WII-ENVIS Centre published a thematic bulletin on "Special Habitats and Threatened Plants of India". This ENVIS bulletin was released during the Annual Research Seminar by Shri S.C. Dey, Secretary General, Global Tiger Forum.

Research Laboratory

The research laboratory extends technical inputs in teaching, training and analysis to research projects and ongoing training programmes of WII. The laboratory is equipped with sophisticated equipment such as atomic absorption spectrophotometers, high performance liquid chromatographs, UV-visible spectrophotometers, microwave reaction systems, automatic nitrogen and fibre analysers, Millipore water purification system, digital pH and conductivity meters, flame photometers and analytical balances., required for the analysis of various physio-chemical parameters of ecological samples. In addition to this equipment the research laboratory is using a fully automatic field kit to analyse the instant DO, EC, pH, turbidity and salinity in deep waterbodies. Teaching classes followed by practical sessions for various ongoing courses of WII on instrumentation and analytical techniques were conducted during the reporting year. These include analysis of herbivore pellets and carnivore scats, collection and preservation of biological materials, collection of age and sex determination data of wild animals, osteological studies of mammals and analysis of ecological samples for various parameters.

Various ongoing research projects utilized the laboratory facility for the analysis of ecological samples: pellet, dung and carnivore scat sample analysis. A total of 1150 samples were analysed during the reporting year. Of these, 550 were ecological samples (analysed for ADF, NDF, lignin, cellulose, crude protein, Ca, Mg, Zn, Cu, Fe, Ni, Mn, Ni, Cr, Pb, EC, pH, Cl, CO₃, HCO₃, and OC), and 600 were pellets and scat samples for food habit studies. The laboratory staff

provided technical inputs in the field including demonstration of various traps, camera traps, mist netting for birds, radio-telemetry and the use of GPSs, to various training programmes. The laboratory staff also collected meteorological data (rainfall, temperature, humidity, wind velocity and direction) in the WII campus. The maximum temperature recorded was 41°C, on May 2, 2009, and the minimum temperature was 5°C, on January 1, 2010. The total rainfall recorded during the year was 989.2 mm.

Herbarium

During the reporting period plant specimens (ca. 2200) were identified for various research projects, from Kedarnath Wildlife Sanctuary, various parts of the Garhwal region in Uttarakhand, and Dudhwa National Park, as well as grasses from south India. Field inputs were provided by the herbarium staff in various regular courses at WII and to visiting classes. The herbarium section is rendering help to the students and researchers in WII and from to those from universities and various agencies.

Wildlife Health Services

Assistance to Rajasthan Forest Department

Sariska Tiger Reintroduction Project: Sariska Tiger Reserve lost all its tigers in 2004, though good potential tiger habitat still existed. In an effort to rebuild a population of tigers at STR, the Government of India entrusted WII and the Rajasthan Forest Department with the responsibility of restocking Sariska with tigers. A recovery plan was prepared by WII. During the year 2008-2009, three tigers (one male and two female) were successfully immobilized, radio-collared and translocated to STR. The operation was the first of its kind attempted by any Tiger Range Country.

The collar of the male tiger that was translocated to Sariska on June 28, 2008 stopped functioning, making it difficult to monitor its movements. Based on a request from the Forest



Department, Dr. Parag Nigam, along with Dr. K. Sankar and WII researchers, successfully immobilized the tiger and replaced the radio-collar on June 25, 2009.

Assistance to Madhya Pradesh Forest Department (MPFD)

Radio-collaring of tiger at Panna: A male tiger was translocated from Pench Tiger Reserve to Panna National Park on November 6, 2009. Due to veterinary emergencies at Pench prior to translocation, the animal could not be collared. A request to assist the department with collaring was received. WII team comprising Dr. Parag Nigam, Dr. K. Ramesh and Shri Vinod Thakur along with team from MPFD and the Jabalpur Veterinary College successfully collared the animal on November 13, 2009. As the animal recovered from sedation and was active, it was finally released in the wild on November 14, 2009.

Capture and translocation of tiger from Tendukheda to Panna National Park: The translocated tiger strayed out of Panna and moved about 250 km to the Tendukheda forest, near Nauradehi Wildlife Sanctuary. A request was received from the MPFD for assistance with capturing the animal. Dr. Parag Nigam, as part of the WII team along with the team from MPFD and Jabalpur Veterinary College, was successful in immobilizing the animal on December 25, 2009 and translocating it back to Panna by road. The animal has settled down in the park.

Radio-collaring of two tigers at Pench Tiger Reserve: As a part of the WII project on "Ecology of Tigers in Pench Tiger Reserve", two tigers were successfully immobilized and radio-collared during January 9-10, 2010 by a WII team comprising Dr. Parag Nigam, Dr. K. Sankar and WII researchers, along with MPFD officials.



Assistance to Uttarakhand Forest Department

Translocation of deer (Axis axis) from Dak Pathar to Timli forest, Kalsi Forest Division: Based on a request from the Executive Engineer, Civil Construction Division, Kalsi, assistance in shifting of a deer from Dak Pathar Barrage Deer Park to

Timli Forest was provided by Dr. Parag Nigam on May 20, 2009. The animal was successfully immobilized and translocated to Timli forest, Kalsi Forest Division.

Management of rescued elephant calf at Chilla Range, Rajaji National Park: A young elephant calf was rescued from Haridwar Range in January 2010. Dr. Parag Nigam provided technical assistance in management of the orphaned calf on November 22, 2009. The park authorities were briefed on critical care of the orphaned animal regarding sanitation and hygiene, nutritional requirements and preventive medication.

Post mortem of crocodile: A request for a post mortem of a crocodile (mugger) *Crocodilus palustris* was received from the Uttaranchal Forest Department. A detailed post mortem of the animal was conducted. The animal died due to shock resulting from a severe traumatic injury on the forehead. The post mortem examination report was submitted.

Assistance to West Bengal Forest Department

A tigress was rescued from a human habitation by the West Bengal Forest Department. A request was received for collaring the animal. Dr. Parag Nigam radio-collared the tigress under the WII project "Ecology of Tigers in Sundarbans Tiger Reserve". The animal was successfully immobilized, collared and released into the wild.

Emergency Services provided to Uttarakhand Forest Department

Management of leopard that strayed into Haridwar Jail: An adult male leopard accidentally strayed into the Roshnabad district jail, Haridwar, during the early hours. Dr. Parag Nigam, along with a Forest Department team, successfully immobilized, rescued and released the leopard in Rajaji National Park on October 30, 2009.

Rescue and rehabilitation of leopard from IMA, Dehra Dun: An adult leopard was trapped in a clutch wire snare trap in a forest patch at Indian Military Academy, Dehra Dun on February 19, 2010. The animal was successfully immobilized, rescued and rehabilitated in the Asarodi Range of the Rajaji National Park.

Management of severely injured and critically ill leopard: An adult leopard was rescued from Narendranagar Forest Division on January 24, 2010. As the animal was severely injured and critically ill, it required intensive veterinary care. Dr. Parag Nigam provided technical assistance with management of the leopard at Asarodi Range and subsequently at Malsi Deer Park during January 24-25, 2010. Though the animal was provided critical care at Malsi, it succumbed to an infection after five days in captivity.

Management of critically injured lame tusker at Rajaji National Park: An adult lame tusker was located in the Beribada Range, Rajaji National Park, Dehra Dun on February 26, 2010 and required a detailed veterinary inspection. The animal was immobilized on February 28, 2010 for a close examination. The animal had sustained two bullet injuries, on the right fore and hind limbs, resulting in a fracture. The animal succumbed to its injuries. A detailed post mortem revealed toxæmic changes.

Conservation Genetics Laboratory

WII conducts a large number of field research projects on bio-diverse taxa, with a few projects having an embedded genetic component in them. The major task of the Conservation Genetics Laboratory is to provide technical services to assist in the conception, analysis and interpretation of such field projects which employ molecular genetic tools to answer ecological questions. During 2009-2010, the laboratory was actively engaged in studies on the: (i) phylogenetics and diversity of avian hematozoan parasites in the western Himalaya; (ii) population genetics of the endangered great Indian bustard (*Ardeotis nigriceps*); (iii) investigating fine-scale genetic structuring among tiger (*Panthera tigris*) populations in the Central Indian Landscape; and (iv) assessing the phylogeography and genetic structure in the golden jackal (*Canis aureus*); and striped hyaena (*Hyaena hyaena*).

(i) Phylogenetics and diversity of hematozoan parasites

A one-year pilot study was conducted on seasonal and altitudinal variations in blood parasites of western Himalayan birds, to examine macro-ecological patterns in transmission, richness and diversity in the vector-mediated parasite community, *Plasmodium* and *Haemoproteus* and their distribution in migrant and resident Himalayan birds across an altitudinal gradient. This region in the western Himalayan belt is rich in avian diversity, including several endemic species; most of the short-distance migrants winter

in the hills or in the plains to the south, while long-distance migrants tend to winter in southern India. High-altitude sites were sampled in April-May, during the breeding season. Birds in the low-altitude sites were significantly more infected than the migrants or resident species in the high-altitude sites. Based on the cytochrome *b* sequences, it is concluded that a huge majority of infections are of *Haemoproteus*, representing 12 lineages whereas *Plasmodium* had 11 lineages which fall into two well-supported clades. The prevalence of both *Plasmodium* ($\chi^2=6.7$, d.f.=11, $P>0.05$) and *Haemoproteus* ($\chi^2=12.3$, d.f.=11, $P>0.05$) in the foothills (600 m) showed no temporal variation across months (December-December); however, the temporal variation across bird species suggested time-independent species-specific prevalence levels ($r=0.80$, $P<0.05$). Comparisons across avian families sampled in the foothills and high altitudes during the breeding season showed no significant difference in parasite prevalence. The similarity in prevalence level was primarily due to the presence of parasite lineages in long-distance migrant species probably sharing similar wintering grounds either in the plains or foothills. Conversely, birds which do not go below 1800 m harboured a distinct parasite fauna.

(ii) Population genetics of the endangered great Indian Bustard

Genetic analyses of the great Indian bustard (GIB) and striped hyaena have been conducted. The GIB is a critically endangered species with a patchy distribution across India. Using DNA obtained from feather and faecal samples ($n=200$) from two main populations in western India, mitochondrial DNA markers (control region and cytochrome *b*) were used. These sequences will highlight the genetic diversity and movements, if any, between GIB populations.

(iii) Assessing the phylogeography and genetic structure in the golden jackal and striped hyaena

The striped hyaena and golden jackal are two sympatric carnivores with a wide distribution spreading across northern Africa and Asia Minor into India. Their distribution raises interesting questions on their origin and phylogeography. The phylogenetic analyses conducted on the striped hyaena till date are based on very few samples and lack a broad phylogenetic perspective on the origin of the species in the subcontinent. Using blood, tissues, museum samples and scat samples collected from representative populations across India and amplifying mitochondrial DNA (cytochrome *b* and control region) from these samples will answer questions on the (a) genetic diversity of the hyaena in India and (b) geographic origin of the striped hyaena. As with the hyaena, genetic analysis of



the golden jackal using DNA extracted from scats, blood and tissues obtained from contemporaneous and museum samples obtained from different localities in India is being carried out at the cytochrome *b* and control region locus of mtDNA and at eight nuclear DNA microsatellite loci to understand the patterns of genetic variation and gene flow across its range in the subcontinent.

(iv) Investigating fine-scale genetic structuring among tiger populations in the Central Indian Landscape

Field collected carnivore scats from several parts of India were confirmed as originating from the tiger based on PCR amplification and restriction enzyme digestion of an ~185 base pair (bp) segment of the mitochondrial DNA cytochrome *b* gene. Work on these samples is presently under way using a panel of 12 unlinked polymorphic microsatellite loci (*Pid sibs* value=0.00733, identified

previously after screening blood samples from wild tigers) in order to provide information on the demographic history, current patterns of genetic variability, and dispersal and gene flow of tigers in the central Indian landscape.

Campus Development

Retrofitting work in the administrative block and renovation of toilets in Old Hostel, Block-A have been initiated during the reporting period. Upgradation of porta cabin (conference hall) has been completed by the Engineering Cell. Procurement and installation of a 320 KVA generator has also been completed. Construction of five Type IV quarters and a brick boundary wall around these quarters in Block III has been completed during the reporting period.



Vinod Verma

visitors

- ◆ Newly recruited Scientists from Indian Council of Forestry Research and Education, Dehradun, April 9, 2009.
- ◆ Forest Range Officer trainees (2008-2009 batch) from the State Forest Service College, Coimbatore, April 15, 2009.
- ◆ Forest Guards from Corbett Wildlife Training Centre, Kalagarh, April 29, 2009.
- ◆ Students of the B.Lib. & I.Sc. Course from the Department of Library & Information Science, Central Library, Kumaon University, Nainital, April 30, 2009.
- ◆ A group of e-governance students from the Indian Institute of Public Administration, New Delhi, May 4, 2009.
- ◆ Range Forest Officer trainees from the State Forest Service College, Burnihat, May 19, 2009.
- ◆ Shri Jairam Ramesh, the Hon'ble Minister of State (Independent Charge) Environment & Forests, Government of India, and President, WII-Society, June 2, 2009.
- ◆ Students from the College of Veterinary and Animal Science, Rajasthan Agricultural University, Bikaner, June 4, 2009.
- ◆ IFS Officers of the 2000 batch of the Advanced Forest Management Training Course at Indira Gandhi National Forest Academy, Dehra Dun, June 9, 2009.
- ◆ Newly recruited Assistant Commandants from ITBP, June 11, 2009.
- ◆ Participants of the ISRO-sponsored NNRMS course from the Indian Institute of Remote Sensing, Dehra Dun, June 11, 2009.
- ◆ Participants of training programme on "Spatial Referencing of MIKE Data" at Forest Survey of India, Dehra Dun, June 24, 2009.
- ◆ Participants from SFS College (2009-2011 course batch), Dehra Dun, July 10, 2009.

- ◆ Cadets and Masters from Rashtriya Indian Military College, Dehra Dun, July 31, 2009.
- ◆ Dr. Ashok Khosla, President, IUCN and Chairman, Development Alternatives, August 3, 2009.
- ◆ Dr. Montek Singh Ahluwalia, the Hon'ble Deputy Chairman, Planning Commission, Government of India, August 10, 2009.



- ◆ A group of IFS Officer trainees (2008 batch) from Indira Gandhi National Forest Academy, Dehra Dun, August 14, 2008.
- ◆ IFS probationers (2009-2011 course batch) from Indira Gandhi National Forest Academy, Dehra Dun, August 27, 2009.
- ◆ German students and faculty from the Department of Tourism, Catholic University, Germany, September 10, 2009.
- ◆ Participants from Central Academy for SFS College, Dehra Dun, September 11, 2009.
- ◆ Officer trainees from Office of Director, SSB Academy, Srinagar (Garhwal), September 22, 2009.
- ◆ Forester trainees of Foresters Training Course and Forest Guards (Uttarakhand) (2009-2010) from Forest Training Circle, Haryana, Pinjore, September 23, 2009.
- ◆ Students from Lewis & Clark College, Portland, Oregon (on educational tour to Navdanya), September 25, 2009.

- ◆ Students from Lingaya's Institute of Management and Technology, Faridabad, Haryana, October 5, 2009.
- ◆ IFS officer trainees of 10-weeks' professional skill upgradation course from Indira Gandhi National Forest Academy, Dehra Dun, October 9, 2009.
- ◆ B.Sc. (Forestry) students from Birsa Agricultural University, Ranchi, October 15, 2009.
- ◆ Students of Class XII from CARMAN Residential & Day School, Shyampur, Premnagar, Dehra Dun, October 21, 2009.
- ◆ 26th batch of Regular Forest Guard Course trainees from Forest Training Institute, Surendranagar, H.P., October 26, 2009.
- ◆ Forester trainees (2009) from Foresters Training academy, Haldwani, October 27, 2009.
- ◆ B.Sc. (Zoology) students from Daulatram College, University of Delhi, October 29, 2009.
- ◆ 53rd batch of Forest Guard trainees from Forest Training Institute, Chail, H.P., November 6, 2009.
- ◆ B.Sc. (Forestry) II Year students from College of Forestry & Hill Agriculture, G.B. Pant University of Agriculture & Technology, Hill Campus, Ranichauri, Tehri Garhwal, Uttarakhand, November 11, 2009.
- ◆ Forestry science students from Kathmandu Forestry College, Koteshwor, Kathmandu, Nepal, November 13, 2009.
- ◆ B.Sc. (Forestry) III Year students from Tribhuvan University, Institute of Forestry, Hetauda Campus, Narayani Anchal, Nepal, November 27, 2009.
- ◆ M.Sc. students (School of Earth Science) from Department of Geology, Solapur University, Solapur, November 30, 2009.
- ◆ Students of B.Sc. II Year of CBZ with Biotechnology and M.Sc. (Zoology) I & II Years from Baba Farid Institute of Technology (PGI), Dehra Dun, November 30, 2009.
- ◆ Officer trainees from SFS College, New Forest, Dehra Dun, December 2, 2009.
- ◆ Students of M.Sc. (Zoology) I & II Years from Baba Farid Institute of Technology, Dehra Dun, December 7, 2009.
- ◆ M.Sc. students from Mar Athanasios College for Advanced Studies, Tiruvalla, Kerala, December 14, 2009.
- ◆ PG students from Indian Institute of Forest Management, Bhopal, December 15, 2009.
- ◆ B.Sc. (Forestry) pre-final year students from North Eastern Regional Institute of Science & Technology (Deemed University), Nirjuli, Itanagar, Arunachal Pradesh, December 23, 2009.
- ◆ Final Year B.Sc. (Forestry) students from College of Forestry, Kerala Agricultural University, Vellanikkara, Thrissur, Kerala, December 23, 2009.
- ◆ Students from College of Veterinary Science & Animal Husbandry, Jabalpur, December 24, 2009.
- ◆ PG students of botany from Shri Shivaji Science College, Amravati, January 1, 2010.
- ◆ IFS officers under training at Indira Gandhi National Forest Academy, Dehra Dun, January 5, 2010.
- ◆ M.Sc. students accompanied by one faculty member from G.B. Pant University, Pantnagar, January 8, 2010.
- ◆ B.Tech. students accompanied by two professors from College of Agricultural Engineering & Post Harvest Technology (Central Agricultural University), Ranipool, Gangtok, Sikkim, January 28, 2010.
- ◆ Cadets accompanied by two Masters from Rashtriya Indian Military College, Dehra Dun, January 29, 2010.
- ◆ Trainees of Kashmir Forest's Training Course (KFC) from Forest Department, Jammu & Kashmir, Soil Conservation Training School, Miran Sahib, Jammu, February 12, 2010.
- ◆ M.Sc. (Environmental Science) students accompanied by their faculty from Shivaji University, Department of Environmental Science, Vidyanagar, Kolhapur, Maharashtra, February 16, 2010.
- ◆ B.Sc. (Forestry) students accompanied by their two faculty members from ASPEE College of Horticulture & Forestry, Navsari Agricultural University, Navsari, Gujarat, March 5, 2010.
- ◆ B.Sc. (Forestry) students accompanied by two faculty members from Sam Higginbottom Institute of Agriculture, Technology & Science, Allahabad, March 11, 2010.
- ◆ M.Sc. (Geo-informatics) students accompanied by two faculty members from TERI University, New Delhi, March 17, 2010.



- ◆ Mr. Francesco Bandarin, Director, World Heritage Centre, World Heritage Convention visited the Institute on March 17, 2010.

- ◆ M.Sc. students accompanied by five faculty members and two technical staff from School of Environmental Sciences, Jawaharlal Nehru University, New Delhi, March 23, 2010.
- ◆ M.Sc. (Forestry) students accompanied by four faculty members/staff from Guru Ghasidas Vishwavidyalaya, Bilaspur, Chhattisgarh, March 26, 2010.
- ◆ SFS officer trainees from Central Academy for State Forest Service, Coimbatore, March 31, 2010.



Vinod Verma

governance

Society

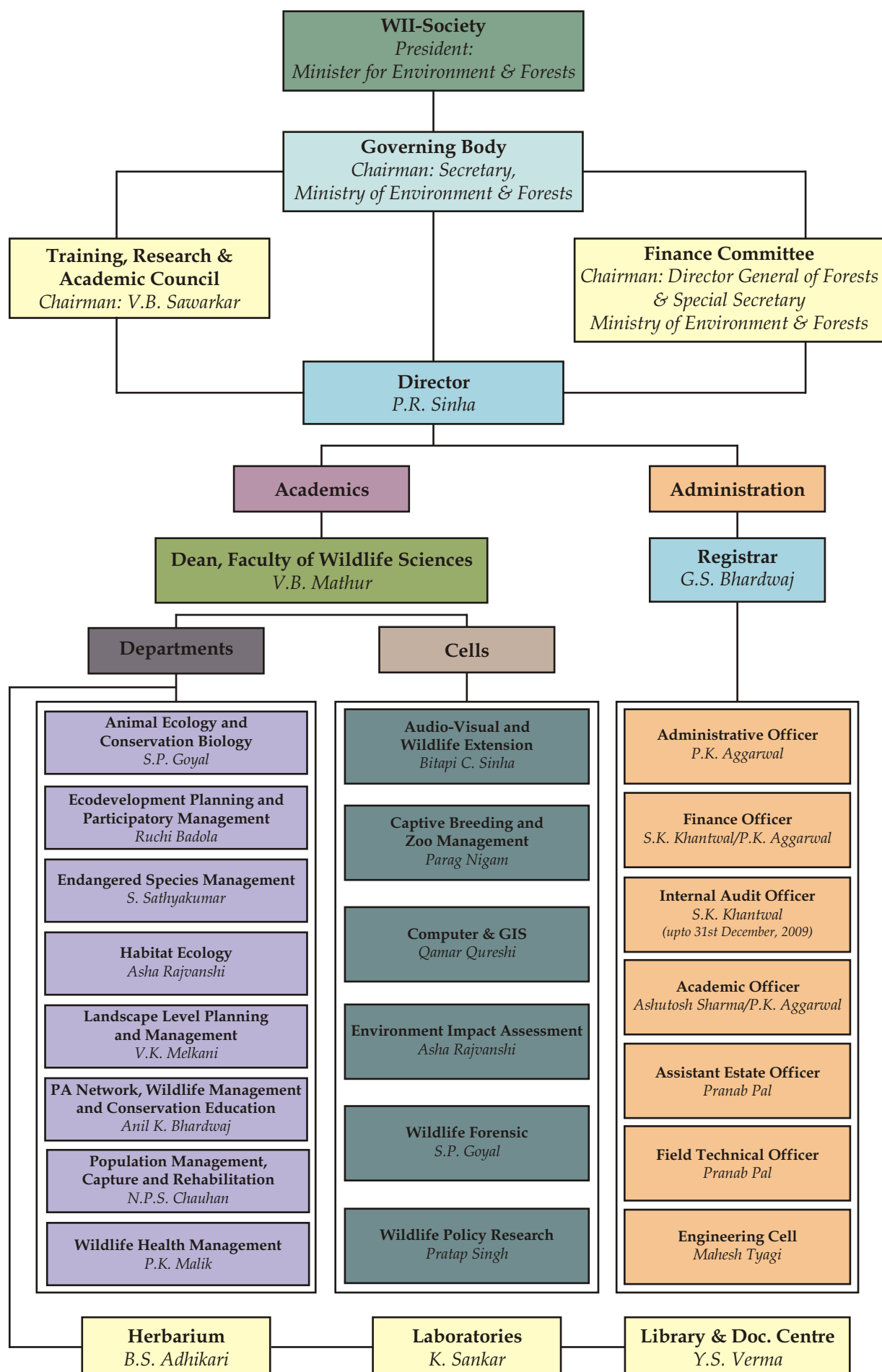
Governing Body

TRAC

Finance

Building

Organizational Structure of WII



The Society of Wildlife Institute of India

The composition of WII Society, the apex body of Governance, is as under:

1. Shri Jairam Ramesh
President,
Minister of State (Independent Charge)
Environment & Forests
Government of India,
Ministry of Environment & Forests,
Paryavaran Bhawan, 'B' Block,
CGO Complex, Lodi Road,
New Delhi - 110 003

Members**

2 to 14 Minister In-charge of the portfolio of Wildlife and/or Forests on a regional rotational basis:

North-east India	-	Sikkim, Tripura and Assam
Eastern India	-	Andaman & Nicobar and Bihar
Western Region	-	Gujarat and Goa
Southern India	-	Karnataka and Andhra Pradesh
Northern India	-	Punjab and Haryana
Central India	-	Uttar Pradesh
Permanent Invitee	-	Uttarakhand

Non-official Members**

15. Shri Brijendra Singh,
28, Sunder Nagar,
New Delhi 110 003
16. Dr. Ullas Karanth,
403, Seebo Apartments,
26-2, Aga Abbas Ali Road,
Bangalore 560 042 (Karnataka)
17. Shri Mahendra Vyas,
53 D, Block-H, Saket,
New Delhi 110 017
18. Shri Pranay Waghre,
Nallamalai Foundation,
1 Old Block, Samrat Complex, Saifabad,
Hyderabad (Andhra Pradesh)
19. Shri Biswajit Mohanty
Shantikunj, Link Road,
Cuttack (Orissa)
20. Shri P.K. Sen,
B-2, 2275, Vasant Kunj,
New Delhi

21. Shri Ashok Singh,
Addl. PCCF & Chief Wildlife Warden (Retired),
5, Clive Road, Civil Lines,
Allahabad (Uttar Pradesh)
22. Dr. Albert Rajendran,
Department of Zoology,
St. John's College,
Palaymkottai (Tamil Nadu)
23. Prof. V.C. Soni,
Department of Biosciences,
Saurashtra University,
Rajkot (Gujarat)
24. Shri Valmik Thapar,
19, Kautilya Marg,
Chanakyapuri,
New Delhi 110 021

Members

- 25 to 29 Representative of following organizations:
- (i) Bombay Natural History Society, Mumbai;
 - (ii) World Wide Fund for Nature-India, New Delhi;
 - (iii) Wildlife Preservation Society of India, Dehradun;
 - (iv) Centre for Environment Education, Ahmedabad;
 - (v) Prakriti Samsad, Kolkatta**

Members (Ex-officio)

30. Secretary to Government of India
Ministry of Environment & Forests,
Paryavaran Bhawan, 'B' Block,
CGO Complex, Lodi Road,
New Delhi - 110 003
31. Secretary to the Government of India,
Ministry of Finance, North Block
New Delhi
32. Secretary to the Government of India,
Ministry of Science and Technology,
Technology Bhawan, New Mehrauli Road,
New Delhi
33. Secretary to the Government of India,
Department of Education,
Ministry of Human Resource Development,
Shashtri Bhawan, **New Delhi**
34. Representative of the Planning Commission,
Yojna Bhawan, Sansad Marg,
Government of India, **New Delhi**

35. A representative of the University Grants Commission,
New Delhi
36. The Chief Secretary,
Government of Uttarakhand,
"Sachivalaya"
Dehradun - 248 001
37. Director General of Forests &
Special Secretary to the Govt. of India,
Ministry of Environment & Forests,
Paryavaran Bhavan, 'B' Block,
CGO Complex, Lodi Road,
New Delhi - 110 003
38. Director, Wildlife Preservation,
Government of India
Ministry of Environment & Forests,
Paryavaran Bhavan, 'B' Block,
CGO Complex, Lodi Road,
New Delhi - 110 003
39. Additional Secretary & Financial Advisor,
Ministry of Environment & Forests,
Paryavaran Bhavan, 'B' Block,
CGO Complex, Lodi Road,
New Delhi - 110 003
40. Director General,
Indian Council of Forestry Research & Education,
P.O. New Forest,
Dehra Dun - 248 006
41. Director,
Zoological Survey of India,
M-Block, New Alipore,
Kolkata - 700 053
42. Director,
Botanical Survey of India,
3 MSO Building,
Block F-5th & 6th Floor,
DF Block, Sector-I, Salt Lake City,
Kolkata (W.B.)

Members

43. Dr. V.B. Mathur**
Dean, Faculty of Wildlife Sciences,
Wildlife Institute of India,
Dehradun
(Faculty representative of WII)
44. Dr. V.K. Melkani**
Scientist-F,
Wildlife Institute of India,
Dehradun
(Faculty representative of WII)

Member Secretary

45. Director,
Wildlife Institute of India,
Dehradun

Permanent Invitee

46. Inspector General (WL),
Ministry of Environment & Forests,
Paryavaran Bhavan, 'B' Block,
CGO Complex, Lodi Road,
New Delhi 110 003
47. Member-Secretary,
National Tiger Conservation Authority,
Bikaner House, Shahjahan Marg,
New Delhi 110 011
48. Director (Project Elephant),
Ministry of Environment & Forests,
Paryavaran Bhavan, 'B' Block,
CGO Complex, Lodi Road,
New Delhi 110 003

***The term of the members at Sl. Nos. (2 to 24), (29), and (43 to 44) is for a period of three years w.e.f. 3rd June 2009 notified vide OM No.DWII/580/2005 Dated 03.06.2009.*

Governing Body

The current Governing Body composition includes official and non-official members as under:

1. Chairman,
Secretary, Government of India
Ministry of Environment & Forests,
Paryavaran Bhavan, B-Block,
CGO Complex, Lodi Road,
New Delhi - 110 003
2. Vice- Chairman,
Director General of Forests & Special Secretary,
Ministry of Environment & Forests, Govt. of India,
Paryavaran Bhavan, B-Block, CGO Complex,
Lodi Road, **New Delhi - 110 003**

Members (Non-official)*

3. Shri Brijendra Singh,
28, Sunder Nagar,
New Delhi 110 003
4. Dr. Ullas Karanth,
403, Seebo Apartments, 26-2, Aga Abbas Ali Road,
Bangalore 560 042 (Karnataka)
5. Shri Mahendra Vyas,
53 D, Block-H, Saket,
New Delhi 110 017
6. Shri Pranay Waghre,
Nallamalai Foundation,
1 Old Block, Samrat Complex, Saifabad,
Hyderabad (Andhra Pradesh)
7. Shri Biswajit Mohanty,
Shantikunj, Link Road,
Cuttack (Orissa)
8. Shri Valmik Thapar,
19, Kautilya Marg,
Chanakyapuri,
New Delhi 110 021

Members (Ex-officio)

9. Financial Advisor & Joint Secretary
Ministry of Environment & Forests,
Paryavaran Bhavan, B-Block, CGO Complex,
Lodi Road, **New Delhi - 110 003**
10. Chief Secretary,
Government of Uttarakhand,
"Sachivalaya", **Dehradun-248 001**

Members*

- 11-16. Chief Wildlife Warden on a regional rotational basis
- | | | |
|-------------------|---|------------------|
| Central Region | - | Madhya Pradesh |
| Southern Region | - | Karnataka |
| North-east Region | - | Meghalaya |
| Eastern Region | - | Orissa |
| Northern Region | - | Himachal Pradesh |
| Permanent Invitee | - | Uttarakhand |

Member (Ex-officio)

17. Director, Wildlife Preservation,
Ministry of Environment & Forests,
Paryavaran Bhavan, B-Block,
CGO Complex, Lodi Road,
New Delhi - 110 003
18. Director General,
Indian Council of Forestry Research & Education,
P.O. New Forest,
Dehra Dun - 248 006

Member

19. Chairman,
Training, Research and Academic Council (TRAC),
Wildlife Institute of India, **Dehradun**
20. Dean, FWS
Wildlife Institute of India,
Dehra Dun - 248 001
(Faculty Representative WII)

Member Secretary

21. Director,
Wildlife Institute of India,
Post Box 18, Chandrabani,
Dehra Dun - 248 001

Permanent Invitee

22. Inspector General (WL),
Ministry of Environment & Forests,
Paryavaran Bhavan, 'B' Block,
CGO Complex, Lodi Road,
New Delhi 110 003
23. Member-Secretary,
National Tiger Conservation Authority,
Bikaner House, Shahjahan Marg,
New Delhi 110 011
24. Director (Project Elephant),
Ministry of Environment & Forests,
Paryavaran Bhavan, 'B' Block,
CGO Complex, Lodi Road,
New Delhi 110 003

* The term of the membership is for a period of three years w.e.f. 3rd June 2009 notified vide OM No. DWI/580/2005 dated 03.06.2009.

Training, Research & Academic Council (TRAC)

1. Chairman,
Shri V.B. Sawarkar,
Former Director, WII
464, Rasta Peth, Near Power House,
Pune – 411 011 (Maharashtra)

Members (Ex-officio)

2. Director (Wildlife Preservation)/
Additional Director General (Wildlife),
Ministry of Environment and Forests,
Government of India,
Paryavaran Bhawan, CGO Complex, Lodi Road,
New Delhi 110 003

3 to 15 Chief Wildlife Wardens on a regional rotational basis

Northern Region	-	Punjab, Delhi
Eastern Region	-	Jharkhand, A&N Islands
Central India	-	Uttar Pradesh
Western Region	-	Goa, Rajasthan
Southern Region	-	Andhra Pradesh, Karnataka
North-eastern Region	-	Sikkim, Meghalaya & Nagaland
Permanent Invitee	-	Uttarakhand

16. Director,
Botanical Survey of India,
(Ministry of Environment & Forests),
CGO Complex, 3 MSO Building,
Block F 5th & 6th Floors, DF Block,
Sector-I, Salt Lake City
Kolkata 700 064 (W.B.)

17. Director,
Zoological Survey of India,
M-Block, New Alipore,
Kolkata 700 053

18. Member Secretary,
Central Zoo Authority,
Bikaner House, Annexe – VI,
Shahjahan Road,
New Delhi 110 011

Non-official Members

19. Dr. Albert Rajendran,
Department of Zoology,
St. John's College,
Palaymkottai (Tamil Nadu)
 20. Prof. V.C. Soni,
Department of Biosciences,
Saurashtra University,
Rajkot (Gujarat)
 21. Dr. Ajith Kumar,
Scientist,
Centre for Wildlife Studies,
1669, 31st Cross, 16th Main,
Banashankari 2nd Stage,
BANGALORE 560 070
 22. Dr. M.C. Sathyanarayana,
Reader,
Department of Wildlife Science,
A.V.C. College,
Mayiladuthurai,
Mannampadai 609 305 (Tamil Nadu)
 23. Dr. V.K. Kashyap,
Director,
National Institute of Biologicals (NIB),
Ministry of Health and Family Welfare,
Government of India,
A-32, Sector – 62,
Noida 201 309
- ### Member
24. Deputy Director General (Research),
Indian Council of Forest, Research & Education
P.O. New Forest,
Dehra Dun
(Representative of the ICFRE)
 25. Dean, Faculty of Wildlife Sciences,
Wildlife Institute of India,
Chandrabani
Dehra Dun

26-27 Two senior-most Heads of Department (in terms of pay-scale),
Wildlife Institute of India,
Chandrabani
Dehra Dun
(to be nominated)

28. Research Coordinator,
Wildlife Institute of India,
Chandrabani
Dehra Dun

29. Member Secretary,
Director,
Wildlife Institute of India,
P.O. Box # 18, Chandrabani,
Dehra Dun - 248 001

Finance Committee

- 1 Director General of Forests & Special Secretary,
Ministry of Environment & Forests,
Paryavaran Bhawan, 'B' Block,
CGO Complex, Lodi Road,
New Delhi 110 003
2. Shri M.B. Lal,
Addl. Director General of Forest &
Director (Wildlife Preservation),
Government of India,
Ministry of Environment & Forests,
Paryavaran Bhawan, 'B' Block,
CGO Complex, Lodi Road,
New Delhi 110 003
3. Financial Advisor & Joint Secretary,
Ministry of Environment & Forests,
Paryavaran Bhawan, 'B' Block,
CGO Complex, Lodi Road,
New Delhi 110 003
4. Shri V.B. Sawarkar,
Chairman, TRAC,
464, Rasta Peth,
Near Power House/Railway Station,
Pune 411 011
5. Shri Biswajit Mohanty,
Shantikunj, Link Road,
Cuttack (Orissa)
6. Dr. V. B. Mathur,
Dean, FWS,
Wildlife Institute of India,
Dehra Dun
7. Shri P.R. Sinha,
Director,
Wildlife Institute of India,
Dehra Dun

Building Committee

- 1 Chairman,
Director General,
Indian Council for Forest Research & Education
P.O. New Forest,
Dehradun
- 2 Chief Engineer, CCU,
Ministry of Environment & Forests,
Paryavaran Bhawan, B-Block,
CGO Complex, Lodi Road,
New Delhi - 110 003
- 3 Member-Secretary,
Director,
Wildlife Institute of India,
Dehradun



Vinod Verma

publications

Peer Reviewed International Journals

Peer Reviewed National Journals

Peer Reviewed International Report

Books

Book Chapters

Workshop/Seminar proceedings

Technical Reports

Technical Manual

Papers presented

Abstracts Published

Popular articles

Peer Reviewed International Journals

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- Adhikari, B.S., Uniyal, S.K., Rawat, G.S., 2009. **Vegetation structure and community patterns of Tehri Dam Submergence Zone, Uttarakhand, India.** Eurasian Journal of BioSciences 3(6): 40–49.
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Vinod Verma

resource lectures

WII Faculty as Resource Speakers

Resource Speakers at WII

WII Faculty as Resource Speakers

Dr. Y.V. Jhala (April 17-20, 2009): **Multivariate statistics.** Workshop for probationers at Indira Gandhi National Forest Academy, Dehra Dun.

Dr. Y.V. Jhala (May 6, 2009): **Tiger conservation and census methodology.** Workshop for guards and rangers at Parambikulam.

Dr. Y.V. Jhala (May 19, 2009): **Is coexistence the answer to large carnivore conservation?** AMITY University.

Dr. Y.V. Jhala (May 20, 2009): **Coexistence of large carnivores and humans.** India International Centre, New Delhi.

Dr. Bilal Habib (May 20-21, 2009): **2 lectures.** Vocational program on natural resources, NDRI Karnal.

Dr. Asha Rajvanshi (June 4, 2009): **Environmental impact assessment.** Indian Institute of Remote Sensing, Dehra Dun.

Dr. R. Badola (June 5, 2009): **Ecodevelopment planning in India.** The participants of NNRMS course for university faculty at Indian Institute of Remote Sensing, Dehra Dun.

Dr. B.S. Adhikari (June 22, 2009): **Rapid mapping exercise for management of NWFPs.** III ToT course under DEFRA project "Capacity Building of Communities Involved in Sustainable Forest Management", Forest Research Institute University, Dehra Dun.

Dr. Parag Nigam (July 6-8, 2009 & July 13-15, 2009): **Various aspects of wildlife health management, such as need for wildlife health management, infectious and non-infectious diseases, management of health and disease in protected areas and in captivity (10 lectures).** 2008-2010 IFS probationers at Indira Gandhi National Forest Academy, Dehra Dun.

Dr. A.K. Bhardwaj (July 8, 2009): **Community participation – Lessons from Periyar Tiger Reserve.** Sardar Ballabhbhai Patel National Police Academy, Hyderabad.

Dr. V.B. Mathur (July 8, 2009): **Protected area design issues.** IFS probationers 2008-2010 course, Indira Gandhi National Forest Academy, Dehra Dun.

Dr. V.B. Mathur (July 16, 2009): **Application of RS&GIS in wildlife conservation.** IFS course, Indian Institute of Remote Sensing, Dehra Dun.

Dr. V.B. Mathur (July 23, 2009): **Conservation planning for PA network in India.** IFS probationers 2007-2009 course, Indira Gandhi National Forest Academy, Dehra Dun.

Dr. Asha Rajvanshi (July 23-24, 2009): **Environmental impact assessment.** Indira Gandhi National Forest Academy, Dehra Dun.

Dr. R. Badola (July 29-31, 2009): **People and wildlife.** The participants of IFS batch 2008-2010. Indira Gandhi National Forest Academy, Dehra Dun.

Dr. B.K. Mishra (July 30, 2009): **Community participation for biodiversity conservation.** IFS probationers of 2008 batch. Indira Gandhi National Forest Academy, Dehra Dun.

Dr. R. Badola (July-August 2009): **Ecological economics and general economics.** 2008-2010 SFS course at Central Academy for State Forest Service, Dehra Dun.

Dr. A.K. Bhardwaj (August 4, 2009): **Leadership.** Central Academy for State Forest Service, Dehra Dun.

Dr. R. Badola (August 4, 2009): **Leadership-cum-motivation issues in forestry.** The participants of training-cum-workshop for in-service SFS officers on HRM issues in forestry. Central Academy for State Forest Service, Dehra Dun.

Dr. A.K. Bhardwaj (September 2, 2009): **Ecodevelopment planning in India.** Indian Institute Remote Sensing, Dehra Dun.

Dr. R. Badola (September 2, 2009): **People's participation in ecodevelopment planning.** The participants of the PG Diploma course and M.Tech. students (2009-1010) at Indian Institute of Remote Sensing, Dehra Dun.

Dr. R. Badola (September 3, 2009): **SWOT analysis, community composition and gender issues.** The participants of the PG Diploma course and M.Tech. students (2009-1010) at Indian Institute of Remote Sensing, Dehra Dun.

Dr. V.P. Uniyal (September 5, 2009): **Role of pollinators during organic farming.** Workshop at Navdanya Farm, Dehra Dun.

Dr. Asha Rajvanshi (September 7, 2009): **Integration of biodiversity in impact assessment: Impediments, opportunities and surprises.** Compulsory training course on “Environmental Impact Assessment for Biodiversity Conservation” for Indian Forest Service Officers.

Dr. Asha Rajvanshi (September 7, 2009): **Public participation in EIA.** Compulsory training course on “Environmental Impact Assessment for Biodiversity Conservation” for Indian Forest Service Officers.

Dr. A.K. Bhardwaj (September 8, 2009): **Ecodevelopment.** Central Academy for State Forest Service, Dehra Dun.

Dr. Asha Rajvanshi (September 10, 2009): **Global best practices guidance for positive planning for biodiversity.** Compulsory training course on “Environmental Impact Assessment for Biodiversity Conservation” for Indian Forest Service officers.

Dr. R. Badola (September 11, 2009): **Economic evaluation of forests.** The participants of general refresher course for in-service SFS officers at Central Academy for State Forest Service, Dehra Dun.

Dr. A.K. Bhardwaj (September 14-15, 2009): **Participatory project planning.** Central Academy for State Forest Service, Dehra Dun.

Dr. R. Badola (September 14-15, 2009): **Participatory project planning.** Central Academy for State Forest Service, Dehra Dun.

Dr. B.K. Mishra (September 15, 2009): **Participatory project planning, monitoring & evaluation.** Regular course for SFS probationers. Central Academy for State Forest Services, Dehra Dun.

Dr. A.K. Bhardwaj (September 24, 2009): **Biodiversity and environment.** Lal Bahadur Shastri National Academy of Administration, Mussoorie.

Dr. V.K. Melkani (September 27-28, 2009): **Coastal management.** Participation in Conservation and Management. Environmental Journalism Course – focusing Coastal Management, SDMRI, Tuticorin.

Dr. Asha Rajvanshi (September 29, 2009): **Public consultations in EIA in decision making.** Lal Bahadur

Sastri National Academy of Administration (LBSNA), Mussoorie.

Dr. Parag Nigam (October 1, 2009): **Practical demonstration of immobilization equipment and accessories.** 2008-2010 IFS probationers at Indira Gandhi National Forest Academy, Dehra Dun.

Dr. V.B. Mathur (October 5, 2009): **PA network planning.** Professional Skill Upgradation Course for IFS Officers, Indira Gandhi National Forest Academy, Dehra Dun.

Dr. A.K. Bhardwaj (October 5, 2009): **Management planning in PAs and tiger reserves.** Indira Gandhi National Forest Academy, Dehra Dun.

Dr. A.K. Bhardwaj (October 6, 2009): **Project formulation and monitoring.** Central Academy for State Forest Service, Dehra Dun.

Dr. B.K. Mishra (October 6, 2009): **Project formulation and monitoring.** Training-cum-workshop on training of trainers. Central Academy for State Forest Services, Dehra Dun.

Dr. Asha Rajvanshi (October 7, 2009): **Strategic environmental assessment.** Indira Gandhi National Forest Academy, Dehra Dun.

Dr. S. Sathyakumar (October 7, 2009): **Long-term monitoring of birds and mammals in Indian Ocean and Antarctica.** Forest Research Institute University, Dehra Dun.

Dr. S.A. Hussain (October 9, 2009): **Wetland conservation and management.** The participants of the professional skill upgradation course for IFS officers at Indira Gandhi National Forest Academy, Dehra Dun.

Dr. A.K. Bhardwaj (October 12, 2009): **Right to Information Act 2005.** Uttarakhand Forest Department, Dehra Dun.

Dr. A.K. Bhardwaj (October 26, 2009): **Biodiversity conservation and ecotourism.** Central Academy for State Forest Service, Dehra Dun.

Dr. A.K. Bhardwaj (October 28, 2009): **Sharing experiences in matters of vigilance in Forest Department and WII.** Ordinance Factory, Raipur, Dehra Dun.

Dr. R. Badola (October 29, 2009): **Economic evaluation of biodiversity.** The participants of training-cum-workshop on “Biodiversity Conservation and Ecotourism” at Central Academy for State Forest Service, Dehra Dun.

Dr. Y.V. Jhala (November 1-4, 2009): **Monitoring tigers, co-predators, prey and their habitat.** Training of trainers workshop for northern Indian states at Corbett Tiger Reserve for forest officials.

Dr. Parag Nigam (November 2-3, 2009): **Various aspects of wild animal immobilization and restraint, and rescue and rehabilitation of problem animals.** 2008-2010 IFS probationers at Indira Gandhi National Forest Academy, Dehra Dun.

Dr. R. Badola (November 10, 2009): **Ecological services from forests.** The participants of the “Key Policy Program Implementation Issues—Related to Forestry Wildlife/Environment”—joint training programme for members of the IAS/IPS/IFS. Indira Gandhi National Forest Academy, Dehra Dun.

Dr. Asha Rajvanshi (November 11, 2009): **Retooling EIA framework for integrating economic valuation and promoting strategic environment assessment as effective tools for decision supports.** One-week in-service training programme for IAS Officers on “Environmental Impact Assessment of Developmental Projects”, Amity School of Natural Resources and Sustainable Development.

Dr. R. Badola (November 12, 2009): **Gender issues.** The participants of the Advanced Forest Management Course. Indira Gandhi National Forest Academy, Dehra Dun.

Dr. Asha Rajvanshi (November 19, 2009): **Environmental impact assessment.** Indian Institute of Remote Sensing, Dehra Dun.

Dr. R. Badola (November 20, 2009): **Ecodevelopment and PA Management.** The participants of the course on “GIS Application in Forest Management”. Indian Institute of Remote Sensing, Dehra Dun.

Dr. S.A. Hussain (November 30, 2009): **Wetland management.** Two weeks' refresher course for SFS officers.

Dr. A.K. Bhardwaj (December 1, 2009): **Ecodevelopment.** Central Academy for State Forest Service, Dehra Dun.

Dr. R. Badola (December 1, 2009): **Environmental economics.** The participants of general refresher course for in-service SFS officers. Central Academy for State Forest Service, Dehra Dun.

Dr. Parag Nigam (December 9, 2009): **Lecture-cum-demonstration on remote drug delivery systems for use in wild animals.** A two-week general refresher course for in-

service officers conducted by Central Academy for State Forest Service, Dehra Dun from November 30 to December 11, 2009.

Dr. V.B. Mathur (December 10, 2009): **MEE of protected areas.** Special AFM course, Indira Gandhi National Forest Academy, Dehra Dun.

Dr. R. Badola (December 11, 2009): **Ecological services from forests.** The participants of the “Key Policy Program Implementation Issues—Related to Forestry Wildlife/Environment”—joint training programme for members of the IAS/IPS/IFS. Indira Gandhi National Forest Academy, Dehra Dun.

Dr. V.B. Mathur (December 22, 2009): **Strategic environment assessment.** IFS-MCT Phase-III, Indira Gandhi National Forest Academy, Dehra Dun.

Dr. V.B. Mathur (January 4, 2010): **Natural heritage conservation.** IFS-MCT Phase-III, Indira Gandhi National Forest Academy, Dehra Dun.

Dr. P.K. Mathur (January 4 & 11, 2010): **Wildlife and biodiversity conservation module on “Wildlife Research in Indian Protected Areas”, “Concepts of Landscape Ecology” and “Tiger Conservation Plan”.** ICFRE-FSI-WII conducted Phase III of the mid-career training for IFS officers. Indira Gandhi National Forest Academy, Dehra Dun.

Dr. B.K. Mishra (January 5-8, 2010): **Concepts and fundamentals of ecodevelopment; Community participation, typology and means of achieving higher levels of participation; Linkages between conservation and development; and Social survey methods and participatory tools and techniques.** M.Sc. Forestry Course, Forest Research Institute University, Dehra Dun.

Dr. S.A. Hussain (January 6, 2010): **Wetland conservation and management.** The participants of the MCT Course at Indira Gandhi National Forest Academy, Dehra Dun.

Dr. S. Sathyakumar (January 11, 2010): **Wildlife conservation in the Himalaya: Issues and challenges.** Ramakrishna Mission Vivekananda College, Chennai.

Dr. V.B. Mathur (January 13, 2010): **Management effectiveness evaluation of PAs.** IFS-MCT Phase-III, Indira Gandhi National Forest Academy, Dehra Dun.

Dr. Asha Rajvanshi (January 13, 2010): **Valuation of ecosystem services.** Wildlife and Biodiversity Conservation

Module of Phase-III of the mid-career training for Indian Forest Service (IFS) officers at Indira Gandhi National Forest Academy, Dehra Dun.

Dr. Asha Rajvanshi (January 21, 2010): **EIA: Legislative and procedural aspects.** Environment Impact Assessment & Valuation Module of Phase-III of the mid-career training of Indian Forest Service (IFS) officers at Indira Gandhi National Forest Academy, Dehra Dun.

Dr. Asha Rajvanshi (January 22, 2010): **Framework for biodiversity inclusive impact assessment.** Environment Impact Assessment & Valuation Module of Phase-III of the mid-career training for Indian Forest Service (IFS) officers at Indira Gandhi National Forest Academy, Dehra Dun.

Dr. R. Badola (January, 2010): **Ecodevelopment planning.** The students of M.Sc (Forestry) IV semester. Forest Research Institute University, Dehra Dun.

Dr. B.K. Mishra (February 10-26, 2009): **Interface resource conflict and strategies for managing biodiversity; Gender concerns in natural resource management; Participatory tools and techniques for micro planning; and conflicts in natural resource management and conflict resolution strategies.** PG Diploma Course in Natural Resource Management, FRI Deemed University, Dehra Dun.

Dr. Bilal Habib (February 11, 2010): **Wolf ecology.** (2 lectures). M.Sc. teaching for FRI Students, WII.

Dr. Bilal Habib (February 12, 2010): **Predation.** (2 lectures). M.Sc. teaching for FRI Students, WII.

Dr. Bilal Habib (February 12, 2010): **Competition.** (3 lectures). M.Sc. teaching for FRI Students, WII.

Dr. S. Sathyakumar (February 25-26, 2010): **Mammals of Himachal Pradesh; Mammal tracks and signs; Wildlife population estimation and monitoring techniques; and Monitoring mountain ungulates.** Training course for foresters, Forest Training School, Sundernagar, Himachal Pradesh.

Dr. Asha Rajvanshi (February 27, 2010): **Development & infrastructure in tiger landscapes tiger conservation.** WII-Smithsonian "Training of Trainers Conservation Practitioners Course".

Dr. R. Badola (February, 2010): **Natural resource planning and management.** The students of Post-Master Diploma in Natural Resources Management. Forest Research Institute University, Dehra Dun.

Dr. S. Sathyakumar (March 2, 2010): **Mammals of Jammu & Kashmir; Mammal tracks and signs; and Wildlife population estimation and monitoring techniques.** Training course for frontline staff of Dachigam National Park, Kashmir, Jammu & Kashmir.

Dr. V.B. Mathur (March 10, 2010): **Management effectiveness evaluation of protected areas.** IFS-MCT Phase-IV, Indira Gandhi National Forest Academy, Dehra Dun.

Resource Speakers at WII

Shri Nitin Kakodkar (April 7, 2009). **Melghat Tiger Reserve - A case study.**

Dr. Beth Middleton, Professor, Louisiana University, Lafayette, USA & Senior Scientist, National Wetlands Research Centre, USGS (April 13, 2009). **World wetlands and climate change.**

Malli Mastan Babu, **World Fastest 7 Summitter** (May 12, 2009). **Mountaineers avenue in Uttarakhand Himalaya.**

Dr. Chris Bowden, Royal Society for the Protection of Birds, UK (July 3, 2009). **Vulture Recovery Programme - Are we in time to save them?**

Mr. Nachiket Chanchani, a Ph.D. Candidate, Department of the History of Art, University of Pennsylvania (August 24, 2009). **Animals in Indian art.**

Dr. Vibhu Prakash, Principal Scientist/ Dy. Director, BNHS (September 7, 2009). **Captive breeding as a mitigation measure to deal with the vulture crisis.**

Shri Ashish Kothari, Kalpvriksha (September 7, 2009). **Forest Rights Act in different areas of our country.**

Dr. Gayatri Singhal, Indian Program Coordinator, United States India Education Foundation, Fulbright Commission in India (November 9, 2009). **Fulbright Fellowship Opportunities.**

Shri V.B. Sawarkar, Former Director, WII (November 11, 2009). **Emerging Challenges in Wildlife Management.**

Dr. Tara Teel, Associate Professor, Colorado State University (January 13, 2010). **Over-view of human-wildlife conflict issues in the United States.**

Mr. Iain Boardman, Chief Executive, Wildlife Information Network (February 8, 2010). **Wildlife Information Network.**

Dr. Lee Skerratt, Wildlife Biosecurity, School of Public Health, James Cook University, Australia (February 8, 2010). **Amphibian diseases & amphibian health as environmental indicator.**

Dr. Danielle Kreb, a Cetacean Specialist, RASI (Conservation Foundation for Rare and Aquatic Species of Indonesia) (March 30, 2010). **Studies on the Irrawaddy dolphins and associated fauna in Mahakam River, East Kalimantan, Indonesia.**

accounts

Separate Audit Report of the Comptroller and Auditor General of India on the Accounts of Wildlife Institute of India for the year ended 31 March 2010.

1. We have audited the attached Balance Sheet of Wildlife Institute of India, Dehradun (WII) as on 31 March 2010, the Income & Expenditure Account and the Receipts & Payment Account for the year ended on that date under Section 19(2) of the Comptroller & Auditor General's (Duties, Powers & Conditions of Service) Act, 1971 read with Section 38G of the Wildlife (Protection) Act, 1972. These financial statements are the responsibility of the WII's management. Our responsibility is to express an opinion on these financial statements based on our audit.
2. The Separate Audit Report contains the comments of the Comptroller and Auditor General of India (CAG) on the accounting treatment only with regard to classification, conformity with the best accounting practices, accounting standards and disclosure norms, etc. Audit observations on financial transactions with regard to compliance with the Law, Rules & Regulations (Propriety and Regularity) and efficiency-cum-performance aspects, etc., if any, are reported through Inspection Reports/CAG's Audit Reports separately.
3. We have conducted our audit in accordance with auditing standards generally accepted in India. These standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free from material misstatements. An audit includes examining, on a test basis, evidences supporting the amounts and disclosure in the financial statements. An audit also includes assessing the accounting principles used and significant estimates made by management, as well as evaluating the overall presentation of financial statements. We believe that our audit provides a reasonable basis for our opinion.
4. Based on our audit, we report that:
 - (i) We have obtained all the information and explanations, which to the best of our knowledge and belief were necessary for the purpose of our audit;

- (ii) The Balance Sheet, Income & Expenditure Account and Receipt & Payment Account dealt with by this report have been drawn up in the format approved by the Ministry of Finance
- (iii) In our opinion, proper books of accounts and other relevant records have been maintained by the Wildlife Institute of India as required under Section 38G of the Wildlife (Protection) Act, 1972 in so far as it appears from our examination of such books.
- (iv) We further report that:

Comments on Accounts

A. Balance Sheet

1. Understatement of Assets

- i) **Current Assets, Loans and Advances Rs 690.75 lakh** : This does not include a sum of Rs 180 lakh paid against a land acquisition case which has been charged to revenue. This has resulted in understatement of Advances on Capital Assets and overstatement of deficit for the year.

2. Overstatement of Assets

During the year 2009-10, WII disposed off the following unserviceable assets, but the depreciated value of these assets has not been reduced from Schedule No. 8. 'Fixed Assets' resulting in overstatement of Assets and excess depreciation was charged on the depreciated value of the asset disposed off.

Assets	Book Value
i) Computers and peripherals	Rs. 48,32,425/-
ii) Lab instruments/electronic items	Rs. 33,56,119/-
Audio Visual/camera/binoculars etc.	
iii) Furniture	Rs. 10,000/-
	(Reserve Price)

B. Grants-in-aid

The Institute received Rs 1921.00 lakh as Grant in aid during 2009-10 (Rs 280.00 lakh was received in March 2010) which was utilized in full.

C. Management letter:

Deficiencies which have not been included in the Audit Report have been brought to the notice of the Director, WII Dehradun through a management letter issued separately for remedial/corrective action.

(v) Subject to our observations in the preceding paragraphs, we report that the Balance Sheet, Income & Expenditure Account and Receipts & Payments Account dealt with by this report are in agreement with the books of accounts.

(vi) In our opinion and to the best of our information and according to the explanations given to us, the said financial statements read together with the Accounting Policies and Notes on Accounts, and subject to the significant matters stated above and other matters mentioned in Annexure to this Audit Report give a true and fair view in conformity with accounting principles generally accepted in India.

- a. In so far as it relates to the Balance Sheet of the state of affairs of the WII as at 31st March 2010; and
- b. In so far as it relates to Income & Expenditure Account of the deficit for the year ended on that date.

For and on behalf of the C&AG of India



Principal Director of Audit (SD)

Place: New Delhi

Date: 19-11-2010

Annexure

(i) Adequacy of Internal Audit System:

No internal audit is being conducted as the Internal Audit Officer is looking after the responsibilities of the Finance Officer since August 2007 to December 2009. After December 2009, the post of Internal Audit Officer is vacant.

(ii) Adequacy of Internal Control System:

There is scope of improvement in the internal control system of the WII as formalities i.e. Vouchers are not crossed and bills not cancelled at the time of signing of cheques, acknowledgement of payments not obtained in most of the cases and revenue stamps not affixed in case of payment more than Rs 5000/-

(iii) System of Physical Verification of Assets:

The Asset Register is not complete. The physical verification of assets had not been carried out for the years 2006-07 to 2009-10

(iv) System of Physical Verification of Inventory:

Inventory of Plantation costing Rs 3438280/- and Trees Rs 2432709/- has not been maintained.

(v) Regularity of payment of statutory dues:

An amount of Rs 52278/- towards EPF subscription and Rs 12280/- on account of TDS was payable as on 31-3-2010 .

WILDLIFE INSTITUTE OF INDIA

RECEIPTS				PAYMENTS			
Particulars	Plan	Non Plan	Total	Particulars	Plan	Non Plan	Total
(A) GRANT-IN-AID							
To Opening Balance							
Cash in Bank	17,023,964.00	0.00	17,023,964.00	By Salaries & Allowance	68,351,958.00	12,000,000.00	80,351,958.00
Cash in Hand	203,337.00	0.00	203,337.00	By Honorarium	23,400.00		23,400.00
				By Fellowship	591,821.00		591,821.00
				By Wages	7,933,397.00		7,933,397.00
To Grant -In-Aid From MoEF	180,100,000.00	12,000,000.00	192,100,000.00	By Travel Expenses	3,253,457.00		3,253,457.00
To Recovery & Advance to staff (Loan & Advance)	380,850.00		380,850.00	By Postage & Telegram	226,412.00		226,412.00
To Grants for Other Projects	1,415,793.00		1,415,793.00	By Electricity & Water	4,735,579.00		4,735,579.00
To Hostel Caution Money	50,500.00		50,500.00	By Medical Advance	259,110.00		259,110.00
To EMD	131,000.00		131,000.00	By Medical Expenses	4,176,656.00		4,176,656.00
To CGEGIS	2,760.00		2,760.00	By Operational Expenditure	1,611,101.00		1,611,101.00
				By OTA	516,589.00		516,589.00
To Rent	428,794.00		428,794.00	By POL for Vehicle /DG Set	2,529,230.00		2,529,230.00
To Bus Charges	102,578.00		102,578.00	By Repair and maint of Veh.	935,952.00		935,952.00
To WII Product	179,739.00		179,739.00	By Publication, Film etc.	1,603,888.00		1,603,888.00
				By Stationery & Comp Consu	1,267,564.00		1,267,564.00
To Interest on Bank Deposit				By Repair & Maintenance of Equipment & Furniture	473,867.00		473,867.00
To Misc. Receipts	588,094.00		588,094.00	By Computer & Accessories	788,980.00		788,980.00
MSc Course Fee	540,197.00		540,197.00	By Furniture & Fixtures	1,623,957.00		1,623,957.00
Travel Advance recovered	58,754.00		58,754.00	By Journals & Periodicals	2,987,526.00		2,987,526.00
FA Recovered	52,093.00		52,093.00	By Lab Expenses (Research Lab)	621,830.00		621,830.00
To Travel Advance (Research Project)	395,916.00		395,916.00	By Lab Equipment (Research Lab)	312,941.00		312,941.00
To FA (Research Project)	2,313,967.00		2,313,967.00	By Office Equipment	35,095.00		35,095.00
To Adv for Exp (FA/TA M.SC)	505,737.00		505,737.00	By Training Equipment	0.00		0.00
				By Library Book	421,592.00		421,592.00
To EPF	46,714.00		46,714.00	By IDS	52,273.00		52,273.00
To Pension Contribution TIER	59,258.00		59,258.00	By AMC of Computers	1,776,138.00		1,776,138.00
				By GPF	152.00		152.00
				By Genetic Lab (Lab Expenses)	778,828.00		778,828.00
				By Genetic Lab (Lab equipment)	68,327.00		68,327.00
				By E Governance	2,390,238.00		2,390,238.00

0.00	By Annual Research Seminar	1,025,345.00			1,025,345.00
0.00	By Bonus	395,324.00			395,324.00
0.00	By Estate Maint / Management	700,962.00			700,962.00
0.00	By Estate Security	7,371,685.00			7,371,685.00
0.00	By Leave Salary & Pension Cont.	1,843,167.00			1,843,167.00
0.00	By Legal Expenses	18,448,178.00			18,448,178.00
0.00	By LTC	870,454.00			870,454.00
0.00	By LTC Advance	89,612.00			89,612.00
0.00	By M. Sc. Course Expenditure	1,928,965.00			1,928,965.00
0.00	To Training/skill upgradation	62,775.00			62,775.00
0.00	By Printing & binding	450.00			450.00
0.00	By Sports Goods	236,728.00			236,728.00
0.00	By Telephone & Tc	504,646.00			504,646.00
0.00	By Transferred to Trg A/c for Exp	4,300,000.00			4,300,000.00
0.00	By Workshop/ Seminar	18,068.00			18,068.00
0.00	By Adv to CPWD for Civil Works	11,500,825.00			11,500,825.00
0.00	By Lab Equipment(Forensic Lab)	1,225,274.00			1,225,274.00
0.00	By Lab Expenses (Forensic Lab)	1,478,819.00			1,478,819.00
0.00	By Govt. Cont to Pension Fund	5,000,000.00			5,000,000.00
0.00	By Sharing of cost of K. V.	1,500,000.00			1,500,000.00
0.00	By Internal Loan	1,311,744.00			1,311,744.00
0.00	By Contingencies (Research Project)	4,017,208.00			4,017,208.00
0.00	By Office Eqpt (Research Project)	463,860.00			463,860.00
0.00	By Camp Exp. (Research Project)	829,301.00			829,301.00
0.00	By Fellowship & Wages (Res. Project)	12,376,203.00			12,376,203.00
0.00	By POL & Maintenance of Vehicle (Research Project)	5,222,317.00			5,222,317.00
0.00	By Travel Exp. (Research Project)	1,883,631.00			1,883,631.00
0.00	By Camp Eqpt (Research Project)	2,423,644.00			2,423,644.00
0.00	By Closing in Bank	7,550,147.00			7,550,147.00
0.00	By Closing in Hand	203,604.00			203,604.00
	A' Total	205,130,794.00	12,000,000.00	217,130,794.00	217,130,794.00
	A' Total	205,130,794.00	12,000,000.00	217,130,794.00	217,130,794.00

(B) CONSULTANCY PROJECTS

RECEIPTS				PAYMENTS			
Particulars	Plan	Non Plan	Total	Particulars	Plan	Non Plan	Total
To Opening in Bank Grant Received Interest Received Other Receipts		15,676,874.00	15,676,874.00	By Camp Equipment		655,242.00	655,242.00
		17,980,237.23	17,980,237.23	By Office Equipment		287,696.00	287,696.00
		382,004.00	382,004.00	By Camp Expenses		12,000.00	12,000.00
		2,158.00	2,158.00	By Fellowship & Wages		1,525,129.00	1,525,129.00
				By Contingencies		1,878,212.00	1,878,212.00
				By Travelling Expenses		2,026,829.00	2,026,829.00
				POL & Maintenance of Vehicle		393,374.00	393,374.00
				By Publication & Printing		543,065.00	543,065.00
				Boarding & Lodging		7,158,456.01	7,158,456.01
				By Advance for Expenses (FA)		77,615.00	77,615.00
				By Corpus Funds		1,038,763.00	1,038,763.00
				By Other Advances		50,000.00	50,000.00
				By Duties & Taxes (Service Tax)		30,724.00	30,724.00
			By Closing in Bank		18,364,168.22	18,364,168.22	
B' Total		34,041,273.23	34,041,273.23	B' Total		34,041,273.23	34,041,273.23

(C) TRAINING ACCOUNT

RECEIPTS				PAYMENTS			
Particulars	Plan	Non Plan	Total	Particulars	Plan	Non Plan	Total
To Opening Balance at Bank Grant Received Interest Earned on Saving A/c Other Receipts		7,840,931.00	7,840,931.00	By Salary & Wages		276,436.00	276,436.00
		4,300,000.00	4,300,000.00	By Travelling Expenses		1,622,988.00	1,622,988.00
		233,460.00	233,460.00	By POL & Maintenance of Vehicle		409,002.00	409,002.00
		2,026,133.00	2,026,133.00	By Boarding & Lodging		1,983,049.00	1,983,049.00
			0.00	By TA/DA & Honorarium Guest		228,381.00	228,381.00
			0.00	By Training Allowance		722,509.00	722,509.00
			0.00	By Contingencies & Misc		513,413.00	513,413.00
			0.00	By Sports Items		22,551.00	22,551.00
			0.00	By Equipments		258,219.00	258,219.00
			0.00	By Office Equipment		85,242.00	85,242.00
			0.00	By stationery		325,423.00	325,423.00
			0.00	Advance for Expenses (FA)		292,704.00	292,704.00
			0.00	By Books		266,891.00	266,891.00
			0.00	By Corpus Fund		1,065,783.00	1,065,783.00
			0.00	By Bank Balance		6,327,933.00	6,327,933.00
C' Total		14,400,524.00	14,400,524.00	C' Total		14,400,524.00	14,400,524.00

(D) GPF

RECEIPTS				PAYMENTS			
Particulars	Plan	Non Plan	Total	Particulars	Plan	Non Plan	Total
To Opening Balance (Bank)		4,700,181.00	4,700,181.00	By Final Payment		1,033,224.00	1,033,224.00
To Opening Balance (Cash)		0.00	0.00	By Investment in FDR (GPF)		5,415,133.00	5,415,133.00
To GP Fund Contribution		9,155,886.00	9,155,886.00	By Advance / withdrawal		4,500,000.00	4,500,000.00
To Interest on Bank Deposit		109,182.00	109,182.00	By Closing Balance (Bank)		3,016,892.00	3,016,892.00
D' Total	0.00	13,965,249.00	13,965,249.00	D' Total		13,965,249.00	13,965,249.00

(E) PENSIONS

RECEIPTS				PAYMENTS			
Particulars	Plan	Non Plan	Total	Particulars	Plan	Non Plan	Total
To Opening Balance in Bank		2,336,137.00	2,336,137.00	By Investment in FDR (Pension Fund)		17,000,000.00	17,000,000.00
To Investment in FDR		8,540,010.00	8,540,010.00	By Commuted Value of Pension		999,888.00	999,888.00
To Interest (Pension A/c)		256,010.00	256,010.00	By Pension/ Family Pension		2,630,854.00	2,630,854.00
To WII Contribution		9,806,856.00	9,806,856.00	By Closing Balance		470,160.00	470,160.00
To Pension Contribution		161,889.00	161,889.00	Cash in Bank			
E' Total	0.00	21,100,902.00	21,100,902.00	E' Total		21,100,902.00	21,100,902.00

(F) CORPUS FUND

RECEIPTS				PAYMENTS			
Particulars	Plan	Non Plan	Total	Particulars	Plan	Non Plan	Total
To Opening Balance		392,789.00	392,789.00	By Investment in RBI Bond		18,000,000.00	2,400,000.00
Misc Receipts		2,327,219.00	2,327,219.00	Transferred to Grant in Aid		2,400,000.00	2,400,000.00
Interests on Saving A/c		22,077.00	22,077.00	Closing Balance		1,143,049.00	1,143,049.00
To Encashment of FDR		18,800,964.00	18,800,964.00	F' Total		21,543,049.00	5,943,049.00
F' Total	0.00	21,543,049.00	21,543,049.00		205,130,794.00	117,050,997.23	306,581,791.23
Grand Total (A+B+C+D+E+F)	205,130,794.00	117,050,997.23	322,181,791.23				


(P.K. Aggarwal)
Finance Officer

(P.R. Sinha)
Director

FORM OF FINANCIAL STATEMENTS (NON-PROFIT ORGANISATION)
WILDLIFE INSTITUTE OF INDIA, CHANDRABANI, DEHRADUN
BALANCE SHEET AS ON 31 MARCH 2010

(Amt. Rs.)

	Schedule	Current Year	Previous Year
CORPUS /CAPITAL FUND AND LIABILITIES			
CORPUS /CAPITAL FUND	1	260,955,915.00	269,466,187.00
RESERVE AND SURPLUS	2	0.00	0.00
EARMARKED/ENDOWMENT FUND	3	18,364,168.00	15,676,874.00
SECURED LOAN AND BORROWINGS	4	0.00	0.00
UNSECURED LOAN AND BORROWINGS	5	350,525.00	1,097,956.00
DEFERRED CREDIT LIABILITIES	6	0.00	0.00
CURRENT LIABILITIES AND PROVISION	7	138,794,807.00	129,395,953.00
TOTAL (A)		418,465,415.00	415,636,970.00
ASSETS			
FIXED ASSETS	8	186,817,463.00	193,659,258.00
INVESTMENTS- FROM EARMARKED / ENDOWMENT FUNDS	9	0.00	0.00
INVESTMENTS- OTHERS	10	162,573,005.00	139,319,182.00
CURRENT ASSETS, LOANS, ADVANCES ETC.	11	69,074,947.00	82,658,530.00
MISCELLANEOUS EXPENDITURE (to the extent not written off or adjusted)			
TOTAL (B)		418,465,415.00	415,636,970.00



(P.K. Aggarwal)
Finance Officer



(P.R. Sinha)
Director

Financial Statement (Non-Profit Organization)

Wildlife Institute of India, Dehradun

SCHEDULES FORMING PART OF BALANCE SHEET FOR THE YEAR ENDED 31 MARCH 2010

SCHEDULE 1: CORPUS/ CAPITAL FUND	(Amt. Rs.)	
	Current Year	Previous Year
Balance as at the beginning of the year	232,860,913.00	245,408,141.00
Add: Contribution towards Corpus/ Capital fund	22,832,382.00	31,996,375.00
Less : Fixed/Current Assets & Pre Receipted Bill of Consultancy Project	0.00	-23,783,103.00
Add/(Deduct) : Balance of net income (expenditure) transferred from	-34,801,550.00	-20,760,500.00
TOTAL A	220,891,745.00	232,860,913.00
Corpus Fund		
Opening Balance	36,605,274.00	33,747,946.00
Received during the year	2,349,296.00	184,013.00
Add Accrued Interest	1,683,062.00	2,673,315.00
Add Interest Earned	1,826,538.00	0.00
Less : Payment made to Grant in Aid	-2,400,000.00	0.00
Total B	40,064,170.00	36,605,274.00
Total A+B	260,955,915.00	269,466,187.00
SCHEDULE 3 : EARMARKED/ ENDOWMENT FUNDS		
a) Opening Balance of the Funds	15,676,874.00	12,652,041.00
b) Addition to the Funds:		
i. Grants received	17,980,237.00	12,031,227.00
iii Interests received	382,004.00	257,257.00
iv. Other Receipts	2,158.00	0.00
Total	18,364,399.00	12,288,484.00
TOTAL (a+b)	34,041,273.00	24,940,525.00
c) Utilisation/Expenditure towards objectives of funds		
i. Capital Expenditure		
Fixed Assets		
Camp Equipment	655,242.00	661,824.00
Office Equipment	287,696.00	50,930.00
TOTAL	942,938.00	712,754.00

ii. Revenue Expenditure		
Camp Expenses	12,000.00	3,000.00
Contingencies/Misc	2,421,277.00	1,617,822.00
Fellowship and Wages	1,525,129.00	1,397,868.00
Travel Expenses	2,026,829.00	1,993,693.00
POL & Maint. Of Vehicle	393,374.00	508,202.00
GIS & Office Data	0.00	189,561.00
Advances for Expenses (FA)	77,615.00	877,814.00
Advances for Expenses (TA)	0.00	149,900.00
Boarding & Lodging	7,158,456.00	1,434,029.00
Transferred to Corpus Funds	1,038,763.00	132,932.00
Amount Transferred to others accounts	0.00	246,076.00
Duties & Taxes (Service Tax)	30,724.00	0.00
Advance paid to firm	50,000.00	0.00
TOTAL	14,734,167.00	8,550,897.00
TOTAL C	15,677,105.00	9,263,651.00
NET BALANCE AS AT THE YEAR -END (a+b-c)	18,364,168.00	15,676,874.00
TOTAL	18,364,168.00	15,676,874.00
SCHEDULE 5 : UNSECURED LOANS AND BORROWINGS		
(1) Central Govt.	0.00	0.00
(2) State Govt.(Specify)	0.00	0.00
(3) Financial Institutions	0.00	0.00
(4) Banks		
(i) Term Loans	0.00	0.00
(ii) Others (specify)	0.00	0.00
(5) Other Institutions and Agencies	0.00	0.00
(6) Debentures and Bonds	0.00	0.00
(7) Fixed Deposits		
(8) Others (Specify)		
Security Deposit	350,525.00	350,525.00
Loans	0.00	747,431.00
TOTAL	350,525.00	1,097,956.00

SCHEDULE 7 : CURRENT LIABILITIES AND PROVISION		
(A) CURRENT LIABILITIES		
(1) Acceptances		
(2) Sundry Creditors		
(1) For Goods		
(2) For Others		
Payment outstanding for Research Project (2007-08)	0.00	100,589.00
Payment outstanding for Research Project (2008-09)	0.00	288,706.00
Payment outstanding for Supply of items(2005-06)	0.00	15,932.00
Other Payments outstanding(Grant-in-aid) (07-08)	265,449.00	620,230.00
Other Payments outstanding(Grant-in-aid) (08-09)	0.00	8,127,364.00
Other Payments outstanding(Grant-in-aid) (09-10) (669528+575645)	1,245,173.00	
(3) Advances Received		
Hostel Caution Money	118,760.00	68,260.00
(4) Interest accrued but not due on		
(1) Secured Loans/Borrowings		
(2) Unsecured Loans/Borrowings		
(5) Statuary Liabilities		
(1) Overdue		
(2) Others (Specify)		
Pension Fund	97,500,245.00	85,623,271.00
GP Fund	38,714,624.00	33,788,003.00
(6) Others (Specify)		
EMD Received	822,853.00	691,853.00
TOTAL (A)	138,667,104.00	129,324,208.00
(B) Provisions		
(1) For Taxation		
TDS (64553-52273)	12,280.00	64,553.00
TDS (Training A/c)		304.00
(2) Gratuity		
(3) Superannuation/ Pension		
(4) Accumulated Leave Encashment		
(5) Trade Warranties/ Claims		
(6) Others (Specify)		
Pension Fund (Tier II)	59,258.00	0.00
GPF	772.00	924.00
Bank Loans	400.00	400.00
CGEGIS	2,715.00	0.00
Sale Tax/Trade Tax/Prof.Tax/ Com. Tax	0.00	0.00
EPF Subscription	52,278.00	5,564.00
EMD Const. Project	0.00	0.00
TOTAL (B)	127,703.00	71,745.00
TOTAL (A+ B)	138,794,807.00	129,395,953.00

SCHEDULE 8: FIXED ASSETS

Particulars	Gross Block					DEPRECIATION				NET BLOCK	
	Cost as at the beginning of the year	Addition during the year		Deduction during the year	Cost as at the end of the year	As at the beginning of the year	For the year	Deduction during the year	At the end of the year	As at the current year-end	As at the Previous year-end
		Upto 30-Sep	After 30-Sep								
LAND											
BLOCK: 0%											
Avenue Plantations	3438280.00	0.00	0.00	0.00	3438280.00	0.00	0.00	0.00	0.00	3438280.00	3438280.00
Land	6607214.58	0.00	0.00	0.00	6607214.58	0.00	0.00	0.00	0.00	6607214.58	6607214.58
Trees	2432709.00	0.00	0.00	0.00	2432709.00	0.00	0.00	0.00	0.00	2432709.00	2432709.00
TOTAL	12478203.58	0.00	0.00	0.00	12478203.58	0.00	0.00	0.00	0.00	12478203.58	12478203.58
BUILDINGS											
BLOCK: 10%											
Architectural & Supervision Fee	4286963.93	0.00	0.00	0.00	4286963.93	476329.33	428696.39	0.00	428696.39	3858267.54	4286963.93
Auditorium	6419599.66	0.00	0.00	0.00	6419599.66	713288.85	641959.97	0.00	641959.97	5777639.69	6419599.66
Boundary Fencing	391216.01	0.00	0.00	0.00	391216.01	43468.45	39121.60	0.00	39121.60	352094.41	391216.01
Boundary Wall	691713.29	0.00	0.00	0.00	691713.29	76857.03	69171.33	0.00	69171.33	622541.96	691713.29
Building Complex	90042899.46	1994000.00	0.00	0.00	92036899.46	9502688.61	9203689.95	0.00	9203689.95	82833209.51	90042899.46
Campus Development	10986451.95	7803000.00	0.00	0.00	18789451.95	1143965.99	1878945.20	0.00	1878945.20	16910506.76	10986451.95
Materials and Supplies	1854067.42	0.00	0.00	0.00	1854067.42	206007.49	185406.74	0.00	185406.74	1668660.68	1854067.42
Tennis Court	253904.97	0.00	0.00	0.00	253904.97	28211.66	25390.50	0.00	25390.50	228514.48	253904.97
Sports Complex	160886.09	0.00	0.00	0.00	160886.09	17876.23	16088.61	0.00	16088.61	144797.48	160886.09
BLOCK: 20%											
Road & Culvert	479601.69	0.00	0.00	0.00	479601.69	119900.42	95920.34	0.00	95920.34	383681.35	479601.69
Staff Quarters	5975897.93	0.00	0.00	0.00	5975897.93	809474.48	1195179.59	0.00	1195179.59	4780718.34	5975897.93
TOTAL	121543202.40	9797000.00	0.00	0.00	131340202.40	13138068.55	13779570.20	0.00	13779570.20	117560632.20	121543202.40
EQUIPMENT											
BLOCK: 20%											
Vehicle	1190595.60	0.00	0.00	0.00	1190595.60	297648.90	238119.12	0.00	238119.12	952476.48	1190595.60
Development of Forensic Lab.	5700705.47	1101093.00	124181.00	0.00	6925979.47	1357727.37	1372777.79	0.00	1372777.79	5553201.68	5700705.47
Training Equipment	1219117.20	0.00	0.00	0.00	1219117.20	304554.30	243823.44	0.00	243823.44	975293.76	1219117.20
BLOCK: 25%											
AC Plant	1166894.45	0.00	0.00	0.00	1166894.45	388964.82	291723.61	0.00	291723.61	875170.84	317232.95
Camp Equipment (project)	317232.95	0.00	0.00	0.00	317232.95	105744.32	79308.24	0.00	79308.24	237924.71	2309197.78
DG Set	2309197.78	0.00	0.00	0.00	2309197.78	379981.93	577299.45	0.00	577299.45	1731898.34	223966.19
EPABX	223966.19	0.00	0.00	0.00	223966.19	74655.40	55991.55	0.00	55991.55	167974.64	5788875.09
Lab Equipment	5788875.09	381268.00	0.00	0.00	6170143.09	1869875.53	1542535.77	0.00	1542535.77	4627607.32	3284245.82

Office Equipment	3284245.82	35095.00	0.00	0.00	3319340.82	1073625.27	829835.21	0.00	829835.21	2489505.62	3284245.82
Training Equipment (Trg A/c)	5318481.87	18721.00	0.00	0.00	5576700.87	1740330.96	1364237.97	0.00	1364237.97	4212462.90	5318481.87
Office Equipment (Project)	15491.25	0.00	0.00	0.00	15491.25	5163.75	3872.81	0.00	3872.81	11618.44	15491.25
Office Equipment (Res. Project)	3417292.91	421099.00	0.00	0.00	3881152.91	938318.80	964943.10	0.00	964943.10	2916209.81	3417292.91
Camp Equipment (Res. Project)	6365522.71	2146361.00	0.00	0.00	8789166.71	1795081.92	2162631.30	0.00	2162631.30	6626535.41	6365522.71
TOTAL	36317619.29	4103637.00	0.00	0.00	41104979.29	10331673.26	9727099.36	0.00	9727099.36	31377879.93	36317619.29
FURNITURE, FIXTURES											
BLOCK : 15%											
Furnitures & Fixtures	7208961.00	1294545.00	0.00	0.00	8832918.00	1272169.59	1300231.80	0.00	1300231.80	7532686.20	7208961.00
Furniture & Fixture	7077.14		0.00	0.00	7077.14	1248.91	1061.57	0.00	1061.57	6015.57	7077.14
TOTAL	7216038.14	1294545.00	0.00	0.00	8839995.14	1273418.50	1301293.37	0.00	1301293.37	7538701.77	7216038.14
OFFICE EQUIPMENT											
BLOCK : 20%											
Office Equipment (Trg. A/c)	157842.40	4690.00	0.00	0.00	243084.40	39460.60	40561.68	0.00	40561.68	202522.72	157842.40
TOTAL	157842.40	4690.00	0.00	0.00	243084.40	39460.60	40561.68	0.00	40561.68	202522.72	157842.40
COMPUTER/PERIPHERALS											
BLOCK : 20%											
Computer and Peripherals	1226305.83		0.00	0.00	1226305.83	306576.46	245261.17	0.00	245261.17	981044.66	1226305.83
BLOCK : 60%											
Computer & Accessories	2011003.59	668527.00	0.00	0.00	2799983.59	2401362.13	1643854.25	0.00	1643854.25	1156129.34	2011003.59
E Governance	0.00	2390238.00	0.00	0.00	2390238.00	0.00	1434142.80	0.00	1434142.80	956095.20	0.00
TOTAL	3237309.42	3058765.00	0.00	0.00	6416527.42	2707938.59	3323258.22	0.00	3323258.22	3093269.20	3237309.42
LIBRARY BOOKS											
BLOCK : 10%											
Journals & Periodicals	10753704.91	876603.00	0.00	0.00	13691717.91	1015244.82	1266101.29	0.00	1266101.29	12425616.62	10753704.91
Library Books	1955337.72	393593.00	0.00	0.00	2376929.72	167191.58	236293.02	0.00	236293.02	2140636.70	1955337.72
TOTAL	12709042.63	1270196.00	0.00	0.00	16068647.63	1182436.40	1502394.31	0.00	1502394.31	14566253.32	12709042.63
GRAND TOTAL	193659257.86	19528833.00	0.00	0.00	216491639.86	28672995.89	29674177.14	0.00	29674177.14	186817462.71	193659257.86

SCHEDULE :10 INVESTMENT - OTHERS		
(1) In the Govt. Securities		
(2) Other approved Securities		
(3) Shares		
(4) Debentures and Bonds		
Investment in RBI Bond (GPF)	9,416,000.00	7,416,000.00
Investment in RBI Bond (Pension)	27,308,000.00	19,308,000.00
Investment in RBI Bond (Corpus Fund)	18,000,000.00	0.00
(5) Subsidiaries and Joint Ventures		
(6) Others (Specify)		
Investment in FDR (Pension Fund)	64,439,124.00	59,183,272.00
Investment in FDR (GPF)	24,171,822.00	19,872,740.00
FDR Corpus Fund	19,238,059.00	33,539,170.00
TOTAL	162,573,005.00	139,319,182.00
SCHEDULE :11 CURRENT ASSETS, LOANS, ADVANCES ETC.		
(A) CURRENT ASSETS		
(1) Inventories		
Closing Stock of Steel & Cement	131,275.00	131,275.00
Advance paid for Journals (Grant in Aid)	53,783.00	106,281.00
Closing Balance of WII Publication	963,866.00	1,005,445.00
CGEGIS	0.00	45.00
(2) Sundry Debtors		
(1) Debts Outstanding for a period exceeding six months	206,937.00	104,926.00
(2) Others (Specify)		
(3) Cash balances in hand (including cheques/drafts and imprest)		
Grant-in-Aid A/c	203,604.00	203,337.00
Training A/c	0.00	0.00
Pension Fund A/c	0.00	0.00
GPF A/c	0.00	0.00
(4) Bank Balances		
(1) With Scheduled Banks		
Grant-in-Aid A/c	7,550,147.00	17,023,965.00
Training A/c	6,327,933.00	7,840,931.00
Pension Fund A/c	470,160.00	2,336,137.00
GPF A/c	3,016,892.00	4,700,181.00
Corpus fund No 4032	1,143,049.00	392,789.00
Endowment Funds	18,364,168.00	15,676,874.00
TOTAL (A)	38,431,814.00	49,522,186.00

(B) LOANS, ADVANCES AND OTHER ASSETS		
(1) Loans		
(1) Staff		
Loan & Advances to Staff	1,130,600.00	1,174,023.00
Advance for expenses to Staff (390738+259110+550+231131+707014)	1,588,543.00	1,854,675.00
Advance for Expenses to Staff (Training A/c)	292,704.00	601,904.00
Advance for expenses (Res. Projects) (29700+83137+259491+373927)	746,255.00	3,455,938.00
(2) Other entities engaged in activities / objectives similar to		
(3) Others (Specify)		
Adv for civil work to CPWD	11,976,310.00	10,272,485.00
Loan to Other A/c To A/c No. 4032	15,774.00	15,774.00
Internal Loan (1311744-747431)	564,313.00	0.00
(2) Advances and other amounts recoverable in cash or in kind or		
(1) On Capital Accounts	0.00	0.00
(2) Prepayments	0.00	0.00
(3) Others (Specify)	0.00	0.00
(3) Income Accrued		
(1) On Investments from Earmarked / Endowment Funds		
(2) On Invesments -Others		
Interest Accrued in FDR (Pension Fund)	5,282,961.00	4,795,862.00
Interest Accrued in FDR (GPF)	2,109,910.00	1,799,082.00
Interest Accrued in FDR (Corpus Fund)	1,683,062.00	2,673,315.00
(3) On Loans and Advances		
(4) Others (Specify)		
Training Cost Accrued But not Received	838,375.00	838,375.00
Pre-receipted bill issued but not received	3,804,705.00	0.00
(4) Expenses payable towards capital/fixed Assets		
(1) Research Projects for 2007-08	0.00	67,475.00
(1) Research Projects for 2008-09	0.00	155,193.00
(2) Grant in Aid A/c 2007-08 (339757-305781)	33,976.00	339,757.00
(2) Grant in Aid A/c 2008-09	0.00	5,092,486.00
(3) Grant in Aid (2009-10)	575,645.00	0.00
TOTAL (B)	30,643,133.00	33,136,344.00
TOTAL (A+B)	69,074,947.00	82,658,530.00



(P.K. Aggarwal)
Finance Officer



(P.R. Sinha)
Director

FORM OF FINANCIAL STATEMENTS (NON-PROFIT ORGANISATIONS)

Wildlife Institute of India, Dehradun

INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 2009-10

(Amt. Rs.)

	Schedule	Current Year	Previous Year
INCOME			
Income from Sales/Services	12	0.00	0.00
Grants/Subsidies	13	169267618.00	130003625.00
Fees/Subscriptions	14	10671035.00	6514205.00
Income from Investments (from earmarked/endowment Funds Transferred to funds)	15	0.00	0.00
Income from Royalty, Publication etc	16	1299205.00	761726.00
Interest Earned	17	1025143.00	1385055.00
Other Income	18	1415793.00	7188423.00
Increase/decrease) in stock of Finished goods and works-in-progress	19	0.00	0.00
TOTAL (A)		183678794.00	145853034.00
EXPENDITURE			
Establishment Expenses (Plan & Non Plan)	20	110921096.00	80070199
Other Administrative Expenses (Plan & Non Plan)	21	77885071.00	57870339
Expenditure on Grants, Subsidies etc.	22	0.00	0.00
Interest	23	0.00	0.00
Depreciation (Net Total at the year end - corresponding to Schedule 8)		29674177.00	28672996
Total (B)		218480344.00	166613534.00
Balance being excess of Income over Expenditure (A-B)		-34801550.00	-20760500.00
BALANCE BEING SURPLUS (DEFICIT) CARRIED TO CORPUS/CAPITAL FUND		-34801550.00	-20760500.00



(P.K. Aggarwal)
Finance Officer



(P.R. Sinha)
Director

Financial Statement (Non-Profit Organization)
Wildlife Institute of India, Dehradun
INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 2009-10

	(Amt. Rs.)	
	Current Year	Previous Year
SCHEDULE :13 GRANTS/SUBSIDIES		
(1) Central Government		
Grant -in- Aid from MoEF	192100000.00	162000000.00
(-) Amt capitalized	-22832382.00	-31996375.00
Total	169267618.00	130003625.00
(2) State Governments (s)		
(3) Government Agencies	0.00	0.00
(4) Institutions/Welfare Bodies	0.00	0.00
(5) International Organisations	0.00	0.00
(6) Others (Specify)		
WII Contribution (Pension A/c)	0.00	0.00
TOTAL	169267618.00	130003625.00
SCHEDULE :14 FEES/ SUBSCRIPTIONS		
(1) Entrance Fees		
M.Sc.Course Fee	540197.00	212987.00
(2) Annual Fees/ Subscriptions	0.00	0.00
(3) Seminar/ Program Fees		
Seminar/ Workshop Fees	0.00	0.00
(4) Consultancy Fees		
Consultancy refund	0.00	0.00
(5) Others (Specify)		
Other Receipt (Training)	2026133.00	1301218.00
Receipt for Training courses	4300000.00	5000000.00
Pre-receipted bill issued but not received	3804705.00	0.00
Misc. Receipts (Training A/c)	0.00	0.00
Receipt for Training Cost		
TOTAL	10671035.00	6514205.00
SCHEDULE :16 INCOME FROM ROYALTY, PUBLICATION ETC.		
(1) Income from Royalty		
(2) Income from Publications		
(3) Others (Specify)		
Misc. Receipts	588094.00	142505.00
WII Products	179739.00	105834.00
House Licence Fee	428794.00	422638.00
Bus Charges	102578.00	90749.00
TOTAL	1299205.00	761726.00

SCHEDULE :17 INTEREST EARNED		
(1) On Term Deposits		
(1) With Scheduled Banks		0.00
Int. on Bank Deposit	0.00	0.00
Interest on FDR	0.00	0.00
Interest on Investment	0.00	0.00
(2) With Non-Scheduled Banks	0.00	0.00
(3) With Institutions	0.00	0.00
(4) Others (Specify)		0.00
Int. on Investment(Training)	0.00	0.00
Interest (Training)	0.00	0.00
(2) On Savings Account		
(1) With Scheduled Banks		
Int. on Savings Account	550749.00	1039247.00
Interest on Saving A/c (Training A/c)	233460.00	191117.00
Interest on Saving A/c (Research Project)	0.00	0.00
(2) With Non-Scheduled Banks	0.00	
(3) Post Office Savings Account	0.00	
(4) Others (Specify)	0.00	
(3) On Loans		
(1) Interest on Loan & Advance	240934.00	154691.00
(2) Others	0.00	
(4) Interest on Debtors and Other Receivables		
TOTAL	1025143.00	1385055.00
SCHEDULE :18 OTHER INCOME		
(1) Profit on Sale/Disposal of Assets		
(1) Owned Assets	0.00	
(2) Assets acquired out of grants, or received free of cost	0.00	
(2) Export Incentives realized		
(3) Fees for Misc. Services		
(4) Others (Specify)		
Misc. Receipts	0.00	0.00
EMD Forfeited	0.00	0.00
Misc. Receipts & (Consultancy A/c)	0.00	0.00
Receipt for Project	1415793.00	7188423.00
TOTAL	1415793.00	7188423.00
SCHEDULE :19 INCREASE/DECREASE IN STOCK OF FINISHED GOODS		
(1) Closing Stock		
(1) Finished Goods		
Closing Stock of WII Publication	0.00	0.00
(2) Work-in-progress	0.00	0.00
(2) Less : Opening Stock		
(1) Finished Goods	0.00	0.00
(2) Work-in-progress	0.00	0.00
TOTAL	0.00	0.00

	Current Year		Previous Year	
	Plan	Non Plan	Plan	Non Plan
SCHEDULE :20 ESTABLISHMENT EXPENSES				
(1) Salaries and Wages				
Fellowship	591821.00	0.00	431643.00	
Honorarium	23400.00	0.00	65550.00	
Medical	4176656.00	0.00	3473745.00	
Salaries & Allowances	66543635.00	12000000.00	50144359.00	11000000.00
Stipend	231970.00	0.00	194400.00	
Wages	7933397.00	0.00	983533.00	
Fellowship & Wages (Research Project)	12376203.00	0.00	9368867.00	
(2) Allowances and Bonus				
Bonus	395324.00	0.00	496178.00	
OTA	516589.00	0.00	630588.00	
LTC	870454.00	0.00	450447.00	
Corps Fund (Training)	1065783.00	0.00	0.00	
Honorarium (Training A/c)	261285.00	0.00	0.00	437091.00
(3) Others (Specify)				
Trans to Consultancy A/C	0	0.00		
(4) Contribution to Other Fund (Specify)				
Leave Salary and Pension Contr.	1843167.00	0.00	1419171.00	
(5) Staff Welfare Expenses				
Uniforms	0.00	0.00	0.00	
(6) Expenses on Employees Retirement and Terminal Benefits				
Final Payment	913395.00	0	0.00	
Leave Encashment & Gratuity	348716.00	0	319844.00	
Leave Salary and Pension Contribution	0.00	0	0.00	
(7) Others (Specify)				
Camp Expenses (Research Project)	829301.00	0.00	654783.00	
TOTAL	98921096.00	12000000.00	68633108.00	15483829.00
SCHEDULE :21 OTHER ADMINISTRATIVE EXPENSES				
AMC of Computers	1776138.00	0.00	878905.00	
Annual Research Seminar	1025345.00	0.00	514459.00	
Contingencies/Misc. (Research Project)	4017208.00	0.00	2539871.00	
Conveyance Charges	0.00	0.00	12862.00	
Cont./Misc.(Training Account)	3678763.00	0.00	0.00	3010616.00
Electricity and Water Charges	4735579.00	0.00	4231632.00	
Estate Maintenance	700962.00	0.00	2533251.00	
Estate Security	7371685.00	0.00	4356349.00	
Govt. Contribution to Pension Fund	5000000.00	0.00	5000000.00	
Lab Expenses (Research lab)	1400658.00	0.00	682007.00	
Lab Expenses (Forensic Lab)	1478819.00	0.00	1203683.00	
Legal Expenses	18448178.00	0.00	882109.00	
M.Sc. Course Expenditure (1928965-231970)	1696995.00	0.00	745666.00	
Operational Expenses	1611101.00	0.00	1342365.00	
Pension Contribution	546212.00	0.00	99016.00	

POL & Maintenance of Vehicle (Research Project)	5222317.00	0.00	3337612.00	
POL & Maintenance of Vehicle (Training A/c)	409002.00	0.00	0	613465.00
POL for Vehicles/DG Set	2529230.00	0.00	3114297.00	
Postage & Telegrams	226412.00	0.00	239783.00	
Printing & Binding	450.00	0.00	154925.00	
Publication	1603888.00	0.00	768576.00	
Repair & Maintenance of Vehicles	935952.00	0.00	1646665.00	
Repair & Maintenance furniture & Fixture	473867.00	0.00	218042.00	
Sharing of cost of Kendriya Vidyalaya	1500000.00	0.00	1800000.00	
Sports Goods	236728.00	0.00	298275.00	
Stationery	1267564.00	0.00	1390294.00	
Training Allowance	722509.00	0.00	0.00	623799.00
Telephone & TC	504646.00	0.00	605445.00	
Training & Skill Upgradation of Staff	62775.00	0.00		
Training Cost Expenditure	4300000.00	0.00	5000000.00	
Travel Exp. (Grant in Aid)	3253457.00	0.00	2751688.00	
Travel Exp. (Research Project)	1883631.00	0.00	2247885.00	
Travelling Expenses (Training A/c)	1900988.00	0.00	0.00	1699933.00
Workshop/Seminar	18068.00	0.00	219387.00	
Less : Cancellation of Supply Order (9094+13042+40654)	-62790.00	0.00	3168391.00	
Less : Pmnt made drng 09-10 for 08-09 (3034878-62790)	-2972088.00	0.00	0.00	
Less : Payment made of 08-09 of Research Project	-288706.00	0.00	0.00	
Less : Cancellation of Supply Order for 2005-06	0.00	0.00	0.00	
Payment outstanding for Grant in Aid, Research Projects (2009-10)	669528.00	0.00	0.00	
Less : Committed liability of Consultancy Project	0.00	0.00	-59884.00	
Less : Cancellation of Supply Order of Training Account for 2007-08	0.00	0.00	-1030.00	
Total	77885071.00	0.00	51922526.00	5947813.00



(P.K. Aggarwal)
Finance Officer



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Director



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