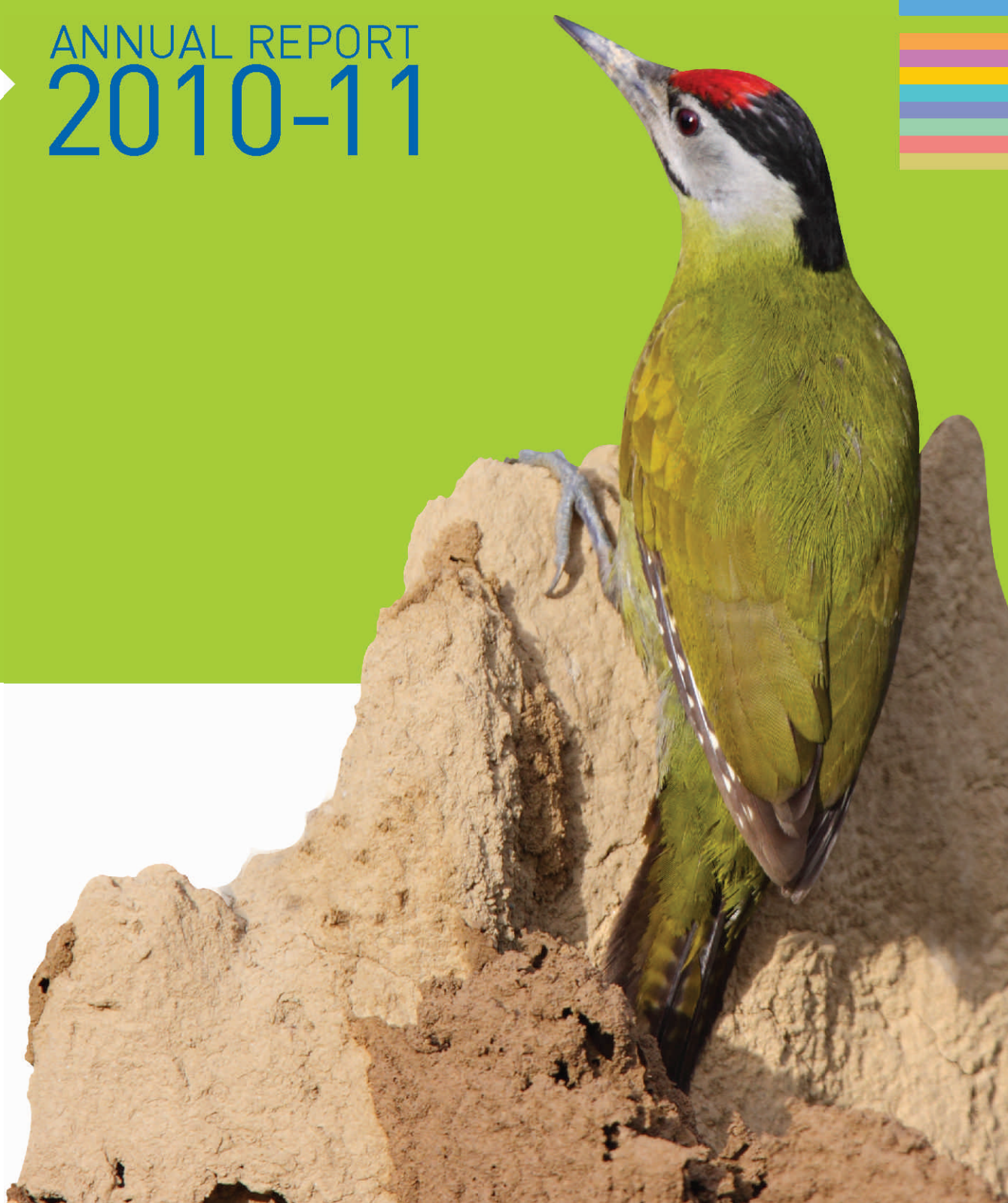
भारतीय वन्यजीव संस्थान
Wildlife Institute of India

ANNUAL REPORT 2010-11



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Editors
Bitapi C. Sinha, K. Vasudevan and K.K. Shrivastava

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K. Ramesh, Lalit Kumar Sharma, S.A. Hussain, G.S. Bhardwaj

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Director's Note

I am pleased to present the Annual Report of Wildlife Institute of India for the year 2010-11. During the period under report, Institute continued to pursue its mandate of complementing the national efforts on conservation of wildlife resources of the country through training, research and advisory support.

As part of the capacity building programmes, a range of training courses were organized, notable among them were the 10-month Postgraduate Diploma in Advanced Wildlife Management and 3-month Certificate Course in Wildlife Management. These programmes aim at enhancing knowledge and skills of the managers for effective management of protected areas. In these two programmes, South and South East Asian countries also sponsored their officials.

The unique feature of the Institute is that its faculty members, who are actively engaged in teaching in various capacity building programmes, also undertake research projects. This helps in continual upgradation of their knowledge and skills in new and emerging areas in the field of wildlife conservation. The learnings from these research projects flow into teaching and are also useful in providing technical and advisory support to Central and State Governments on wildlife matters. Accordingly, 44 research projects form part of Institute's activity during the period under report. These projects were on species and habitat conservation and application of modern technology and tools in wildlife management and research. One of the highlight of the year under report has been translocation of herd of 19 Gaur (the Indian Bison) from Kanha Tiger Reserve to Bandhavgarh Tiger Reserve in Madhya Pradesh. This exercise was part of collaboration with Madhya Pradesh Forest Department and experts from South Africa. The translocated population is being monitored by a team of Institute's researchers and faculty. This exercise is first of its kind in this part of the world and a landmark in application of new tools and techniques in adaptive wildlife management.

As part of advisory support to Ministry of Environment & Forests, Institute was called upon to undertake Cumulative Environmental Impact Assessment (CEIA) of Hydro-electric projects on aquatic and terrestrial biodiversity in Alaknanda and Bhagirathi river basins in Uttarakhand. This study again has been first of its kind ever undertaken in India. Part of this task has been completed during the period under report. This study opens a new window on environmental governance in the country. It has the potential of not only mainstreaming biodiversity concerns at larger scales but also will help in reducing the delays in decision-making process on various developmental projects.

The Institute will continue to strive in realization of the mandate assigned to it by the Government in future also.

(P.R. Sinha)
Director

ROLE & MANDATE

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- INTRODUCTION
- OUR MISSION
- AIMS AND OBJECTIVES

Introduction

The Wildlife Institute of India (WII) is an autonomous organization of 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 the Institute to build a competent faculty and staff through rigorous training and exposure to modern research and analytical techniques.

The Institute'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 the 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 accord 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.

RESEARCH REPORTS

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

Completed Projects

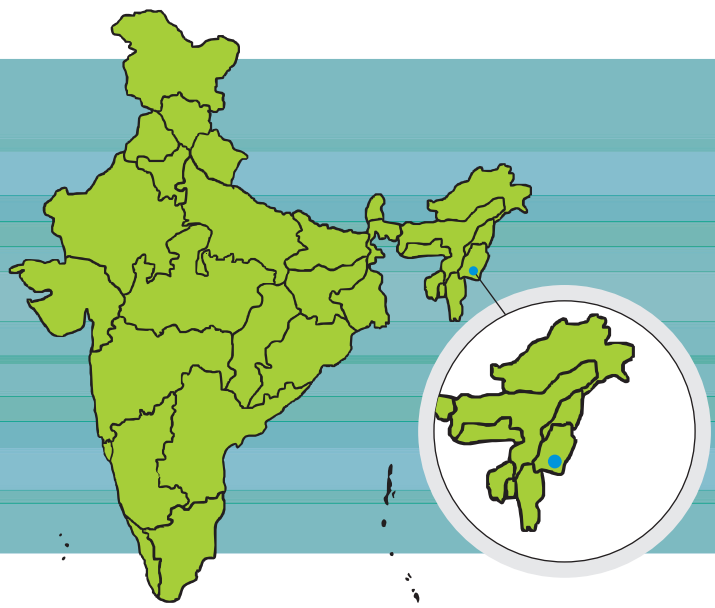
Funding source
Grant-in-aid

Investigators
Dr. S.A. Hussain and Dr. R. Badola

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

Date of Initiation
December 2004

Date of Completion
March 2011



Objectives

The major objectives were 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 sangai and associated grazers.

(iii) Monitor the population of 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 sangai and associated grazers in the Park.

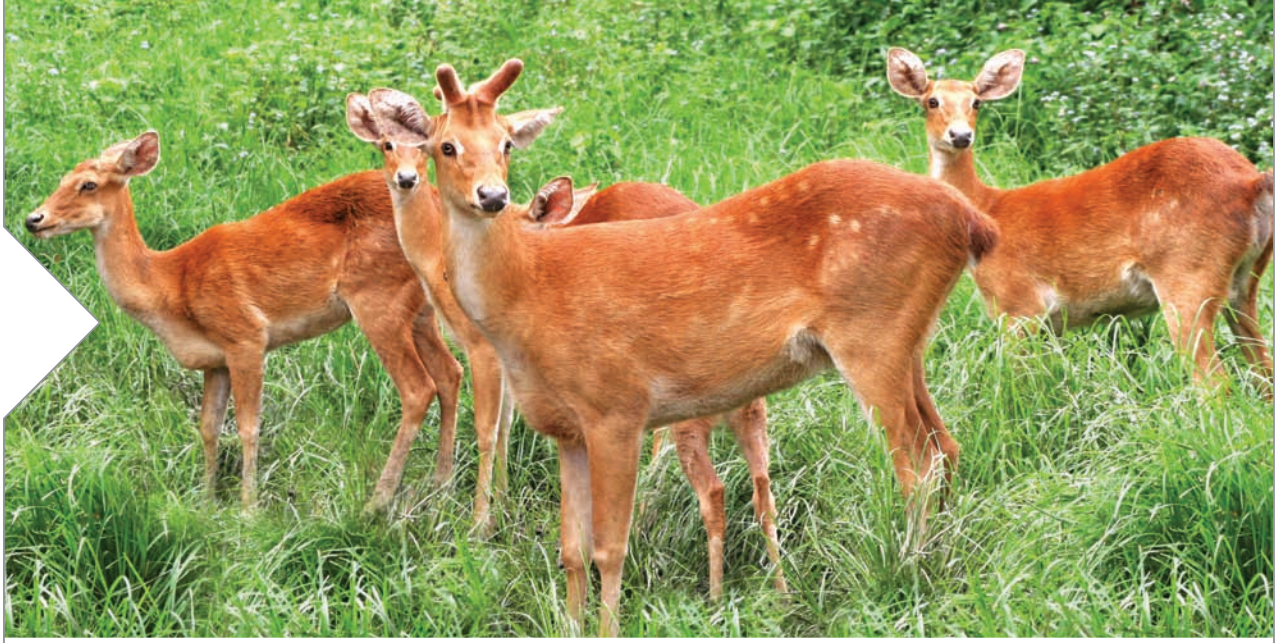
(vi) Examine the variation in the mitochondrial DNA as well as nuclear DNA using control region and micro-satellite primers to gain a better understanding of the genetic population structure.

(vii) Explore the possibility of establishing a second home for sangai in the wild within Manipur State.

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

Progress

A total of 41 plant species were recorded in 16 sampling enclosures, out of which 20 plant species were food plants of both sangai and hog deer. The mean annual biomass of the 41 species recorded was 2075.70 ±486.7 gm^{-2} out of which 1550.74±17.0 gm^{-2} alone was contributed by the food plant species. The thick *phumdis* contributed most to the annual biomass, followed by the thin *phumdis* and hard ground. The percentage contribution of annuals was highest in the thin *phumdis*, followed by the hard ground and the thick *phumdis*. Productivity of annuals was highest in the thin phumdis and least in the thick *phumdis*. Only 465.36 ±168.1 gm^{-2} of the total annual forage biomass of 2075.70 ±486.7 gm^{-2} was utilized by wild ungulates. Across the season, *Zizania latifolia*



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contributed the maximum biomass among all the forage species during summer and monsoon seasons and annually, whereas *Arundo donax* contributed the maximum biomass only in winter.

Significant Findings

Examination of the water quality of Loktak Lake and KLNP revealed a hyper-eutrophic condition but the mean biological oxygen demand was low. The concentration of total nitrogen and phosphorus was high. Though the concentration of heavy metals was not significant, lead and zinc were found in low concentrations.

The thickness of the *phumdi* is crucial for the survival of the sangai. The findings revealed that the thickness of the *phumdi* in the park is showing a decreasing trend. The thickness is decreasing at a faster rate in the southern part of the park than in the north.

During the study about 95 plant species belonging to 22 families were recorded. The family Poaceae was found to be the most dominant family with 19 species, followed by the family Cyperaceae, with 12 species. Ninety-two plant species were recorded in summer and 51 species were recorded in winter. The greater number of species recorded in summer could be because of a great number of annuals compared with perennials in the plant structure. Perennials were found to form 14% of the plant community structure in the park. Eight plant communities were identified both in winter and summer. Different communities were found to show a preference for thick or thin *phumdis* or hard ground. There are differences in the communities in winter and summer.

During 2006-2008, the presence of sangai was recorded in an extent of 21.5-22.7 km^2 of the park and the estimated densities of the sangai were 4.04, 4.08 and 4.05 individuals per km^2 during 2006, 2007 and 2008 respectively, with a minimum of 2.97 individual per km^2 and a maximum of 6.01 individuals per km^2. The mean population size of sangai was estimated as 91, 88 and 92 individuals during 2006, 2007 and 2008, respectively, with a minimum of 60 and maximum of 136 sangai. This indicated that the population of sangai in the park was more or less stable.

The presence of hog deer was recorded in 22.04-22.73 km^2 of the park. The estimated density of hog deer was 2.93, 2.75 and 25.1 in 2006, 2007 and 2008, respectively, with a minimum of 1.82 individual per km^2 and maximum of 4.32 individuals per km^2. The estimated mean population size of hog deer was 65, 61 and 57 individuals during 2006, 2007 and 2008, respectively, with a minimum of 41 and a maximum of 96 hog deer. The study revealed a declining trend in the hog deer population in the park.

Phylogenetic analysis of Eld's Deer, *Rucervus eldii* was carried out using seven published sequences of *Rucervus eldii eldii*, 10 sequences of *Rucervus eldii thamin*, five sequences of *Rucervus eldii siamensis* and 12 sequences of *Rucervus eldii hainanus* along with two samples of *Rucervus eldii eldii* from KLNP and one sample from the Manipur Zoological Garden. The study showed that *Rucervus eldii eldii* is closer to *Rusa unicolor* than to *Rucervus duvaucelii* and *Axis axis*. Apart from four wild clads, a new group from the National Zoological Park Delhi has emerged.

For the wild population of sangai the number of alleles observed across the 19 loci examined varied from one to six, whereas the mean number of alleles per locus was 3.78. The results showed heterozygosity of 60% indicating a moderate genetic variation in the wild population. When the captive population of sangai was compared with the wild population, the allele diversity estimates of the former were roughly half of those of the wild population. When the genetic constituents of the sangai of Delhi Zoo were analysed separately, the allele diversity estimates were 20% of those of the wild population, indicating that the population is highly inbred.

The number of alleles observed across the 19 loci for the hog deer population varied from one to five, whereas the mean number of alleles per locus was 2.42. The average observed heterozygosity, Ho, was estimated at 0.27, and the expected heterozygosity (He) was estimated at 0.34. The polymorphic information content value was 0.28. The heterozygosity was around 30%.

The habitat use study revealed that the extent of habitat use by sangai increased with *phumdi* thickness and short grass cover and decreased with distance to hill. In the case of the hog deer, an increase in *phumdi* thickness, decrease in vegetation cover and increase in short grass cover influence the habitat use. The study on foraging ecology revealed that graminoids formed the highest proportion in the summer diet of the sangai and followed by forbs.

The diet of hog deer was dominated by graminoids and forbs in all the seasons. Seventeen plant species were eaten in summer and 18 each in monsoon and winter. In summer 13 species of graminoid and four species of forbs were recorded in the diet.

Chemical analyses of the forage species revealed a seasonal change in forage quality, with food plant species having the highest nutritional values in summer and the lowest values in monsoon with a gradual increase in winter. The principal forage species were of constantly high nutrient quality. The study also examined the nutrient content of the main forage species. The crude protein levels were highest in summer, when the plants were in their sprouting/vegetative stage. The calorific value of the forage showed a slight increase from winter to summer and was highest in the monsoon.

The acid detergent lignin (ADL) content of *Persicaria perfoliata* was exceptionally high. *Persicaria perfoliata, Carex cruciata, Hedychium coronarium and Cyperus sp.* showed an ADL content higher than 13% but in two major forage plants, *Leersia hexandra* and *Capillipedium sp.*, the ADL content was found to be less than 10% in all the seasons (7.3% and 7.9%, respectively). The DMD level was highest for all the seasons in *Alternanthera philoxeroides* followed by *Oenanthe javanica*. *Leersia hexandra* showed the highest DMD level among the graminoids. In most of the forage species the DMD level was highest in summer; *Osbeckia stellata* was the only forage species having lowest DMD level in summer with a slight increase in the monsoon and the highest level in winter.

The mineral contents of the forage varied across species and seasons. The calcium (Ca) concentration ranged from 0.30% in *Coix lacryma-jobi* to 1.7 % in *Oenanthe javanica* in summer. Although, there was a significant difference in the Ca concentration among forage species within the season, less variation was seen in different seasons. The Ca concentrations in the forbs *Osbeckia stellata, Alternanthera philoxeroides, Persicaria perfoliata, Oenanthe javanica* and *Hedychium coronarium* were much higher than in the grasses.

The phosphorus (P) concentrations of all species were low in summer. The magnesium (Mg) concentrations of *Arundo donax* and *Oenanthe javanica* showed an increasing trend from summer to monsoon whereas the concentration in *Saccharum spontaneum* decreased from summer to the monsoon and was lowest in winter. The potassium (K) concentration was highest in summer, followed by winter and the monsoon.

The socio-economic component of the study revealed that 65% of the total households residing in the peripheral villages of the park extract wetland product. The highest frequency of such extraction was in the villages of the western cluster. Vegetable extraction was highest in the western villages (44%) as their secondary source of income. Fuelwood extraction was highest (36%) in the western villages followed by the northern and southern villages. Fodder extraction was highest (43%) in the south owing to the large number of fish farms present there followed by the western cluster (40%). There was an increasing trend in extraction of biomass from December to April, which decreased after October.

As much as 62% of the households in the western villages directly depended on the park for their livelihood, the direct income from the park amounting to Rs.39, 676 per annum. A smaller number of families derived direct income in the eastern cluster (32%), while the least direct income was observed in the southern cluster villages, amounting to Rs. 18,711 annually. The percentage contribution of income from the park resources to the total annual income was 48.5% in the western cluster, 32.1% in the northern cluster and 18.9% in the eastern cluster. The percentage contribution to annual family income for only those who depended on the park ranged from 57.3% to 59.5% for all village clusters put together.

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

Funding Source
Grant-in-aid

Investigators
Dr. Yadvendra V. Jhala,
Dr. Asad R. Rahmani and
Dr. (late) Ravi Sankaran

Researchers
Ittira P. Bopanna, Kamlesh K. Maurya and Sutirtha Dutta

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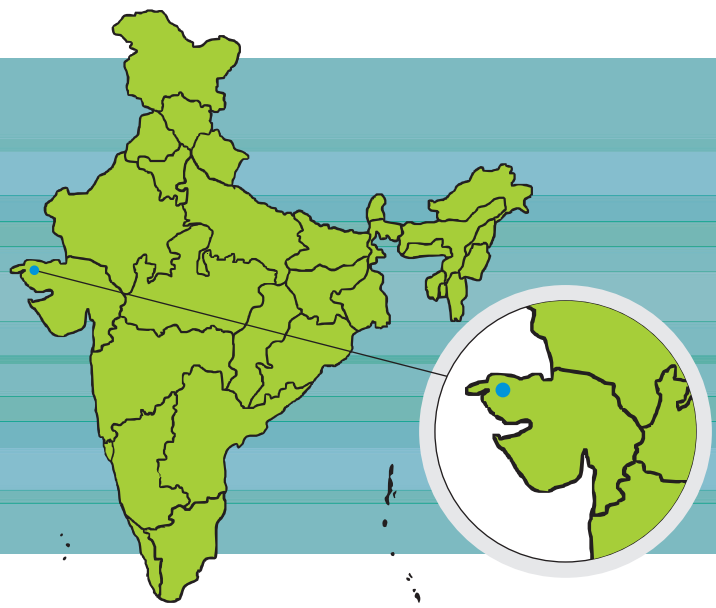


Objectives

The objectives of the project were 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 the 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.

(vii) Evaluate the ecological and economic sustainability of traditional pastoral practices, and evaluate the impact of wolf livestock depredation on the economies of these communities.

Progress

Environmental stochasticity and human induced land use changes affect resource availability and alter the abundance and behaviour of wildlife. These aspects were investigated between 2005 and 2011 by monitoring the population, habitat relationships, diet, and ranging patterns of a spectrum of species that represent different trophic levels and likely respond at different scales in Abdasa (Kachchh). There was an overall increase in annual rainfall (227 mm, 187 mm, 561 mm, 564 mm, 314 mm, 498 mm and 888 mm from 2004 to 2010), cropping intensity (~19%, ~23%, ~29%, ~39% and ~50% crop-cover from 2007 to 2011) and infrastructure across successive years. While increased rainfall corresponded to increased food availability for wildlife, agro-infrastructural intensification increased environmental toxicity and, consequently, mortality risks.

Spiny-tailed lizard Saara hardwickii (STL)

The STL population was monitored by counting

active burrows in four distinct patches, along five or six 1 km × 2 m belt-transects in each patch. The active burrow density declined from 90.83 ± 58.14 (2007) to 72.7 ± 31.21 (2008), 29.79 ± 15.31 (2009) and 30.95±19.99 (2010). The team modelled the STL density at a patch in a year with lag-year rainfall and/or current crop-cover using a linear mixed-effect model with the patch as the random effect. It was found that the STL population fluctuations were antagonistically influenced by both previous year rainfall (ß = 1.5 ± 0.5) and current crop-cover (ß = -1.3 ± 0.6). This basically implied that the forage benefits to the STL from increased rainfall were negated by associated cropping induced habitat reduction. To estimate habitat selection by lizards, burrow occurrence and habitat variables were recorded in 20 m diameter plots (n = 288). The team modelled burrow occurrence with logical combinations of habitat variables using logistic regression. Multi-model averaged parameter estimates suggested that STL preferred natural land (ß = 1.55 ± 0.62), grassland habitat (ß = 0.74 ± 0.34) and moderate livestock grazing (ß = 0.44 ± 0.17) but avoided tall (>1m) vegetation (ß = -0.34 ± 0.17).

Indian desert jird *Meriones hurrianae (IDJ)*

The IDJ was captured from 16 colonies using Sherman traps and the colony population sizes were estimated under a closed population capture-mark-recapture framework in MARK. Colony parameters (length, width, number of holes) were regressed against mark-recapture population estimates to develop predictive models for estimating population sizes from indices. Population sizes varied from two to ten individuals. The number of holes in a colony provided robust estimates of the number of individuals in that colony (N=16, R^2=0.96, t=18.19, p<0.001). Habitat variables were recorded in 84 and 75 sampling plots in a 4 km^2 area each, in agriculture and grass-scrub habitats respectively. Colony occurrence was modelled with logical combinations of habitat variables. The best-fit model indicated that the proportion of clay in soil (ß = 0.12 ± 0.04) and presence of fallow-fields (ß = 4.22 ± 1.51) significantly explained the IJD occurrence. The scan and focal animal sampling methods were used to observe IJD behaviour in agriculture (three colonies) and natural (four colonies) habitats during winter and summer in 2010-2011. Irrespective of season and site, the major proportion of activity time was spent foraging. This study has generated baseline information for a species that can impact predator and vegetation dynamics. With the ominous conversion of traditional pastoral lands to agriculture in recent times, it is crucial to identify the impacts of this change on this species through further research.

Lesser Florican *Sypheotides indica (LF)*

The LF population was monitored in 130km^2 of prime bustard habitat between Lala and Virachia villages in this landscape. The line-transect based density of male floricans was estimated using DISTANCE, and their habitat preferences were investigated through occupancy modelling using PRESENCE. The density was less in the drought year 2008 (0.57_{Mean}, $0.10\text{-}1.04_{95\%CI}$ km^{-2}) compared with wet years (1.28_{Mean}, $0.61\text{-}1.95_{95\%CI}$ km^{-2} in 2007; 1.17_{Mean}, $0.85\text{-}1.61_{95\%CI}$ km^{-2} in 2009; and 1.33_{Mean}, $0.91\text{-}1.94_{95\%CI}$ km^{-2} in 2010) and corresponded with grass height as a proxy for rainfall (r=0.95, P<0.01). Species-detectability increased late in the breeding season, in cloudy/rainy weather and early in the morning. Correcting for imperfect detection, the occupancy in 1 km^2 grids (n = 112) was positively influenced by area of grasslands with ample herbaceous vegetation (odd's-ratio=3.32_{Mean}, $0.93\text{-}11.87_{95\%CI}$) and distance from human structures (odd's-ratio=3.78_{Mean}, $1.04\text{-}13.78_{95\%CI}$). With increasing grassland area in occupied grids, the density increased at a higher rate in agro-grasslands (ß = 3.3 ± 0.91) than in grasslands and agriculture and savannah patches (ß = 1.12 - 2.27). This implied that short croplands might act as 'pseudo-grasslands' to attract this exploded-lekking species, but the interspersion of large grasslands was crucial for their continued usage for breeding.

Great Indian Bustard *Ardeotis nigriceps (GIB)*

The GIB population was monitored by line-transect based distance sampling using DISTANCE and occupancy sampling using PRESENCE. Continuous decline in GIB density and occupancy were observed across years, most likely due to agro-infrastructural intensification. Habitat selection was investigated at two scales: (a) in 16-km^2 grids by modelling the GIB encounter rate with habitat variables using OLS regression; and (b) by comparing independent samples of 'used' and 'available' 100 m radius plots in a logistic regression framework. At the macro-scale, summer-usage was positively influenced by grassland area (ß = 0.004 ± 0.002), squared-proximity to traditional lek (ß = 0.24 ± 0.08) and productivity (ß = 0.004 ± 0.003), and negatively influenced by terrain ruggedness (ß = -0.0007 ± 0.0004) and human disturbances (ß = -0.007 ± 0.003), while winter-usage was positively influenced by grassland area in the adjoining matrix (ß = 0.0007 ± 0.0003) and productivity (ß = 0.006 ± 0.004). At the micro-scale, habitat choice was variously influenced by vegetation structure, food resources and disturbance depending on the life-history activity: foraging, resting, roosting, display and nesting. Birds typically bred in undisturbed grasslands during April and July-September.

Indian Fox *Vulpes bengalensis (IF)*

The IF population status was monitored from the density of breeding pairs in 200 km^2 of the

landscape characterized by agriculture, grassland, scrubland and a cropland mosaic. The den clusters of fox-pairs were intensively searched and identified using auxiliary radio-telemetry information from 12 foxes fitted with TELONIX VHF radio-collars. Den clusters were enclosed by minimum convex polygons and buffered by the half mean distance between cluster-centroids (empirically similar to the home range radius) to realize animal utilization areas and obtain the breeding pair density. The density did not vary across years (0.3 ± 0.06 in 2007, 0.4 ± 0.12 in 2008, 0.3 ± 0.04 in 2009, 0.25 ± 0.04 in 2010, and 0.33 ± 0.06 in 2011) and was uncorrelated to lag-year rainfall or cropping intensification. The radio-telemetry technique was used to study their spatial organization in a 50 km^2 study area. Twelve individuals were captured using Tomahawk and soft leg-hold traps. Their 95% fixed kernel home range was estimated at 1.8 ± 0.2 km^2. The IF diet was analysed from scats (n=3878) collected from 25 dens across 5 years. Diet stabilized at 130 scats and showed 24 food items. A threefold decrease in reptile biomass was observed, and a fivefold increase in fruit-crop biomass was also observed in the IF diet from 2006 to 2010. This corresponded to the decreasing lizard density and increasing agricultural food in the natural environment across these years. The results implied that the IF tolerated rainfall-land use perturbations up to certain levels through its adaptive nature.

Striped Hyaena *Hyaena hyaena (SH)*

To understand the life-history of SH at the interface of human land uses, 6 hyenas of 1-4 years from 4 breeding areas were captured. They were radio-tracked using VHF telemetry for 7-48 months. Their 95% MCP home range was estimated at $54_{Mean} \pm 11_{SE}$ km^2. From continuous night monitoring, it was found that SH movement was definitive towards villages. Food biomass of 21 villages was estimated within the composite home range of collared individuals, by counting livestock and estimating dog numbers by colour based mark-resight technique in Program MARK. There were ~8000 cattle, ~16000 sheep and goat and ~1200 dogs in this area. Frequent checks at the village dump yard found ~10% annual mortality rate of each species. The diet of SH was estimated from scats (n=1460) and regurgitated pellets (n=466). Diet was chiefly composed of cattle, sheep, goat, and dogs; other natural prey items contributing less. While villages formed known food sources for SH, accessing these resources through vast agricultural mosaic and infrastructurally developed areas increased mortality risk. Thus 57% collared individuals were killed as non-target species in snares set for agricultural pests, and 14% died in road accidents.

White-Backed Vulture *Gyps bengalensis (WBV)*

In the light of vulture extinction crisis due to diclofenac prevalence in livestock husbandry, we conducted advocacy program and replaced diclofenac by meloxicam in a buy-back scheme from pharmaceutical vendors and 'Panjrapol' (animal shelter) managers during 2004-06. The drug was subsequently banned from animal husbandry use at the state and national levels (2007-09). We monitored white-backed vulture nesting success from 2004-2011. Nest counts declined from 4-7 nests/village (2004-06) to 2-3 nests/village (2008-11) but nesting success changed from 71±7% (2004-05) to13±6% (2008-09) to 53±10% (2010-11).

Conclusion

This study provided a holistic view of the nature, mechanisms and variations of species-environmental responses of an information-poor but threatened ecosystem. It was found that differential response of wildlife to rainfall-land use perturbations. Notably, many endangered populations were found declining due to the socio-ecological shift from the traditional agro-pastoralist livelihood to the intensive agro-industrial economy. It is therefore recommended that the major parts of this landscape should be protected as Conservation/ Community reserve under Government-private mixed land ownership, since this approach will safeguard the traditional economies of the local communities (which are being ousted by industrialization and intensive agriculture) as well as provide the needed habitats and food resources for the endangered fauna of Kachchh.

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

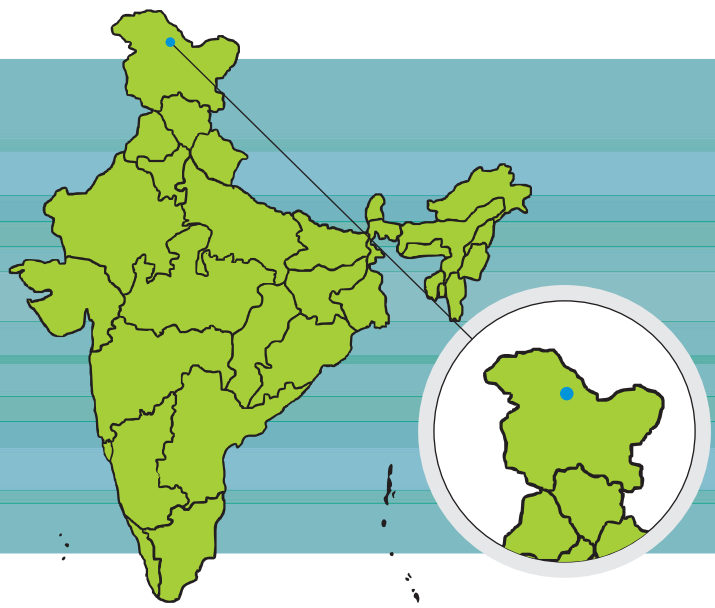
Funding source
Grant-in-aid

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

Researcher
Ashwini Kumar Upadhyay

Date of initiation
January 2007

Date of completion
March 2011



Objectives

The objectives of the project were to :

(i) Study the habitat characteristics and the pattern of use by wild ungulates.

(ii) Assess the population and seasonal movement patterns of ungulates.

(iii) Assess the conservation status of various ungulates.

(iv) Suggest conservation and management strategies and evolve a protocol for long-term monitoring.

Progress

Data on various aspects of study were analysed, and the final report was prepared. The study revealed that of the five species of sympatric ungulate, the chiru and wild yak used only parts of Changchenmo Valley, while the remaining three species were found in adjacent areas. The populations of 20-30 chiru, 110-120 wild yak, 125-150 kiang, 120-130 blue sheep and 35-50 Tibetan argali were estimated to be in Changchenmo Valley. It was concluded on the basis of past reports and the present study that chiru population in Changchenmo Valley is declining. The study confirmed the presence of male chiru in Changchenmo Valley in winter. The status and habitat preference of other ungulates have been described in the report.

Outputs and Outcomes

The major conservation issues in the study area included the following:

(i) Small and fragmented populations of threatened ungulates.

(ii) Degradation of rangelands and loss of productivity.

(iii) Possible genetic contamination of wild yak.

(iv) Presence of feral dogs around security camps.

(v) Lack of alternate livelihoods for the local people.

(vi) Inadequate infrastructure and manpower for PA management.

Milestone

A detailed monitoring protocol based on vehicle

surveys, on-foot patrolling and animal observations from fixed positions has been suggested.

Significant Findings

A new location where the chiru occurs, *i.e.*, Thratsang La in Changthang plateau, was reported. The study reveals that of the five species of sympatric ungulate, the chiru and wild yak use only parts of Changchenmo Valley, while the remaining three species are found in both the areas. The team estimated populations of 20-30 chiru, 110-120 wild yak, 125-150 kiang, 120-130 blue sheep and 35-50 Tibetan argali to be present in Changchenmo Valley. It was concluded on the basis of past reports and the present study that the chiru population in Changchenmo Valley is declining. The study confirmed the presence of male chiru in Changchenmo Valley in winter.

The study area is partly controlled by the Indian security personnel, who have taken a keen interest in the conservation and monitoring of threatened wildlife in the area. A detailed monitoring protocol based on vehicle surveys, on-foot patrolling and animal observations from fixed positions has been suggested.

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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

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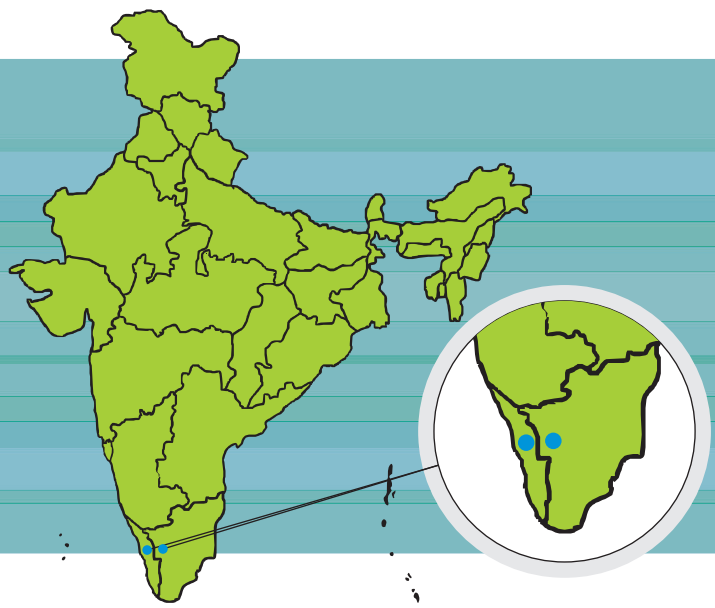
Date of completion
March 2011



Objectives

The objectives of the project were to:

(i) Estimate the population density of the Travancore tortoise and cane turtle in a fragmented landscape.

(ii) Quantify the diet of these two species and describe the feeding ecology with respect to their roles 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.

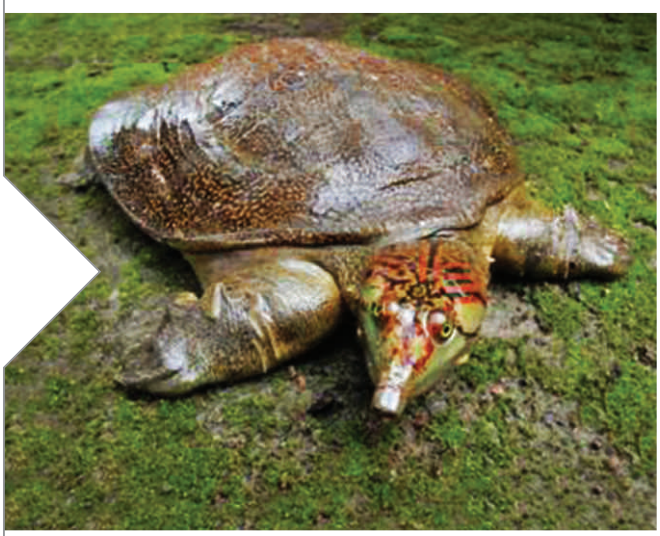
(iv) Carry out a survey of these two species along the Western Ghats to ascertain the exact distribution in the context of the protected area network in the region.

Progress

The study employed methods to study the population, diet and ranging patterns of the cane turtle *(Vijayachelys silvatica)* and the Travancore tortoise *(Indotestudo travancorica)* in Anamalai and Parambikulam tiger reserves. Travancore tortoises were searched for on forest trails scattered in the reserves, with the searches repeated over 3 years to determine the proportion of the area occupied after accounting for imperfect detections. These surveys revealed that about 82% of the area surveyed was occupied by the tortoise, suggesting that the reserves hold a sizeable population of the tortoise. The occupancy of the Travancore tortoise was negatively influenced by anthropogenic disturbance levels and positively influenced by the availability of water bodies and grass marshes at different sites. There were detections at only 35% of the sites occupied by the species, suggesting that it is cryptic. The important constituents of its diet were grass, other plant matter, invertebrates and other animal matter. *Vayals* (grass openings within woodlands) might be a crucial habitat for the foraging of the Travancore tortoise. The five individuals that were radio-tagged used an area of 5 to 35 ha, including evergreen, bamboo and open scurb-grass marshes. The animals spent about 98% of their time under leaf litter, logs, rocks crevices, tree holes, termite or pangolin burrows, bamboo tickets and grass.

In the case of the cane turtle, the various search

methods employed did not yield detections, and therefore one area was combed intensively. This resulted in detections of the elusive cane turtle. During the study, spanning over four years, 42 ha of evergreen forest in the reserve yielded sightings of 27 different individuals of the cane turtle. This suggested that the species occurs in high densities in evergreen forests. Six cane turtles were fitted with radio-transmitters and monitored for 2 years. They used an area from 3.5 to 14.2 ha restricted to the evergreen forests. They also had extensive overlaps in their home ranges, suggesting that there is no territoriality in the species. The movement of the animals was influenced by temperature and rainfall



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in the intensively studied area. The diet of the species consisted of forest floor invertebrates, seeds and other plant material.

A survey of three endemic species of turtle was taken up in 2010. The survey involved visiting 12 sites in the states of Karnataka and Tamil Nadu. Potential sites where the species might be found were visited, and the locals were interviewed in order to document the occurrence of the species. This resulted in one new locality record for the cane turtle and two new records for the Travancore tortoise. Leith's soft-shell was reported from five different locations in Karnataka and Tamil Nadu in interviews with locals. The sites occupied by the species were located within and outside protected areas. So far the study has resulted in three peer reviewed publications and two presentations at international conferences.

Outputs and Outcomes

Based on the findings of the study, it could be inferred that the Travancore tortoise is sensitive to human disturbance. This might be the consequence of exploitation of the animal by the locals in the reserves where the study was conducted. It is not uncommon to find locals using domestic dogs during their forays into the forest. It was speculated that there was some level of subsistence exploitation of the species in the region. The behaviour and ranging pattern of the species make them cryptic but vulnerable to detection by domestic dogs. The study revealed that the awareness among wildlife protection staff in the reserves about the species is poor in general. Increasing the awareness of the staff could curb the subsistence exploitation of the species in the reserves. The *vayals* in the reserve are a crucial habitat for the species; therefore, their protection and monitoring is important for the continued existence of the tortoise population. Contrary to our initial expectations, the cane turtle survives in high densities (60 individuals in 1 km^2) in the middle and low elevation evergreen forests (between 10 and 1000 m above mean sea level). It was found that Karian Shola National Park has a large population of this species. The species is extremely stenotypic, showing a strong preference for a narrow range of microclimatic variation prevailing in evergreen forests that are below 1000 m elevation in the Western Ghats. This indicates that the low elevation evergreen forest areas are crucial habitats for the species. Extensive surveys to document the distribution, status of the population and genetic and morphological variations in the populations of Leith's soft-shell in peninsular India were suggested.

Significant Findings

New perspectives/findings include the following :

(i) The Travancore tortoise is sensitive to human disturbance; this might be a consequence of exploitation of the animal by the locals in the reserves where the study was conducted. It is not uncommon to find locals using domestic dogs during their forays into the forest. We speculate that there is some level of subsistence exploitation of the species in the region.

(ii) The *vayals* in the reserve are crucial habitats for the species; therefore, their protection and monitoring are of importance for the continued existence of the tortoise population.

(iii) The cane turtle survives in high densities (60 individuals in 1 km^2) in the middle and low elevation evergreen forests (between 10 and 1000 m above mean sea level). Karian Shola National Park, Tamil Nadu has a large population of this species which is of importance in the management of the protected area.

(iv) Only scattered records of Leith's soft-shell were obtained. We suggest extensive surveys be carried out to document its distribution, population status and genetic and morphological variations in peninsular India.

Panthera tigris Genome: Implication in Wildlife Forensics

Ongoing Projects

Funding Source
Grant-in-aid

Investigator
Dr. S.P. Goyal

Researchers
Sudhanshu Mishra and Sujeet Kumar Singh

Date of Initiation
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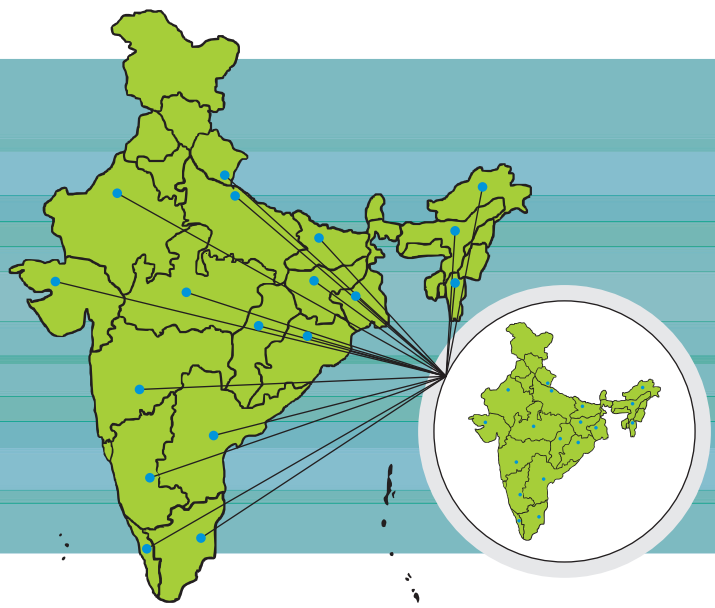
Date of Completion
September 2011



Objectives

The present study was aimed at developing a multi-locus genotype profile of the tiger with the following objectives :

(i) To develop and establish protocols for identifying the tiger in various seizures in the form of skins, nails, whiskers and bones based on DNA techniques.

(ii) To establish a non-invasive technique for genotyping different populations of tigers in India.

(iii) To determine the origin of various tiger parts and products seized in actions against wildlife offences.

(iv) To study the genetic diversity in different tiger populations of India.

Progress

More than 448 probable tiger scat samples were collected from different tiger populations during the reporting period. GPS locations were recorded for all the scats collected so far. All collected scat samples were dried in an oven at 55°C and catalogued. DNA was extracted from scat and tissue samples collected from different tiger populations using a QIAamp DNA Stool Mini Kit (QIAGEN, Germany) and DNeasy Tissue Kit (QIAGEN, Germany), respectively.

Felid specific microsatellite loci, Ple46 (98 bp amplicon with leopard DNA and 85 bp amplicon with tiger DNA) were amplified for species identification. A duplex PCR was used for amplification of partial fragments of the SRY gene along with a microsatellite locus as an internal, just to confirm that the non-amplification of the SRY primer was because the sample was from a female and not due to PCR failure.

Twenty-three highly polymorphic loci were selected. These had been initially developed for the domestic cat, snow leopard and Bengal tiger. To minimize the cost and time, we attempted to design a multiplex PCR panel. Five multiplex PCR panels were designed using MULTIPLEX MANAGER.

These loci were amplified with confirmed tiger samples from Corbett Tiger Reserve (CTR), Dudhwa Tiger Reserve (DTR) and Rajaji National Park (RNP),

and their genetic characteristics were compared in all three populations. It was found that the CTR population had a higher average number of alleles (Na), average expected heterozygosity (H_E) and number of private alleles compared with the DTR and RNP populations. The number of effective alleles was higher in CTR and DTR than in RNP. The observed heterozygosity was in the order CTR > DTR > RNP, while the expected heterozygosity was in the order CTR > RNP >DTR.

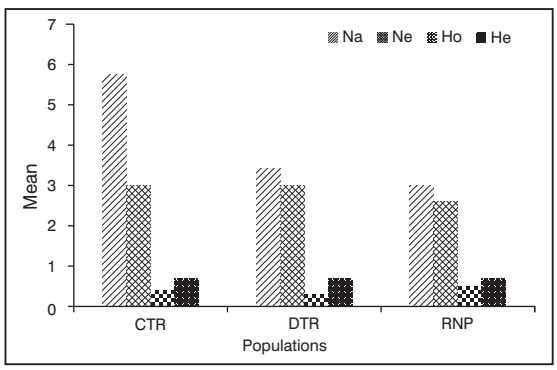


Figure. Comparative mean values of observed heterozygosity (H_O) and expected heterozygosity (H_E) in different populations.

Scat samples collected from Ranthambore Tiger Reserve (RTR), Kanha Tiger Reserve (KTR), Bandhavgarh Tiger Reserve (BTR) and Pench Tiger Reserve (PTR) were subjected to similarity analysis. The average number of alleles was higher in KTR and PTR, compared with RTR and BTR. Observed heterozygosity was in the order BTR > KTR > PTR > RNP while the expected heterozygosity was in the order KTR > PTR > BTR > RTR.

The genetic distances between the 4 populations were also assessed using the pair wise population F_{ST} (via frequency) value, which indicates the extent of gene flow among populations till the recent past. The F_{ST} value (0.036) shows a high gene flow between KTR and PTR, while there is a moderate gene flow (F_{ST} = 0.089) between KTR and BTR. Very little or no gene flow was observed between BTR and PTR.

The allelic diversity indicates that in northern India the majority of alleles have been retained by the Corbett population, while in central India the majority of alleles have been retained in the BTR and KTR populations. The RTR tiger population shows a loss of many alleles, which may be due to an isolated population without any genetic exchange and the present population being from a stock reported to number 14 individuals in 1973. The limited information obtained for tigers from zoos (n = 8) indicates sharing of most of the alleles with central Indian tiger populations, which clearly indicates that these tigers in zoos may be from a central Indian tiger population.

Outputs and Outcomes

The genetic structures in western and central India tiger populations were examined using scat samples of the tiger from RTR, KTR, BTR and PTR. The observed heterozygosity was in the order BTR > KTR > PTR > RTR. The genetic distances between RTR, KTR, BTR and PTR were examined using the pairwise population FST (via frequency) value, and it was observed that there is a high gene flow between KTR and PTR, while there is a moderate gene flow between KTR and BTR. No gene flow was observed between BTR and PTR.

As the sample size of a few populations is small, interpretation should be cautious. The genetic diversity in northern, central and western India tiger populations was compared using different diversity statistics and parameters to get a basic idea. In northern India, the majority of alleles have been retained by the Corbett population, while in central India the majority of alleles have been retained by the BTR and KTR populations. The RTR tiger population shows the loss of many alleles. It is intended to analyse more samples from these populations to get a clear picture of the genetic structure.

Milestones

The team was successful in establishing methods for identifying the species and sex from scat samples. The applicability of multiplex panels was established, including 23 microsatellite loci, for blood, tissue and scat DNA samples. The genetic structure of the tiger populations of the Terai Arc Landscape and western and central India has been studied and described.

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

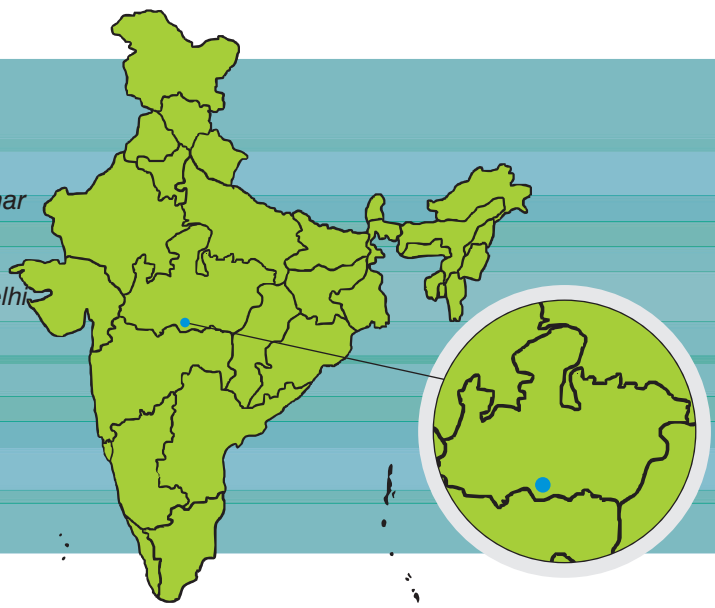
Funding source
Grant-in-aid

Investigators
Dr. K. Sankar, Dr. Y.V. Jhala, Shri Qamar Qureshi, Wildlife Institute of India, and Dr. Rajesh Gopal, National Tiger Conservation Authority, New Delhi

Researcher
Aniruddha Majumder

Date of initiation
October 2005

Date of completion
March 2013



Objectives

The objectives of the project are to :

(i) Collect information on the ranging, movement and dispersal patterns of tigers.

(ii) Study habitat use by tigers.

(iii) Gather information on the food habits of the tiger.

(iv) Assess the population of prey species.

(v) Prepare a habitat suitability map for the tiger and its prey and suggest recommendations for effective management of the tiger population in Pench Tiger Reserve and adjoining areas.

Progress

One adult female was re-collared and one sub-adult male tiger was radio-collared, and these were monitored between April 2010 and March 2011 to understand the home range and dispersal patterns of tigers. In total, 80 camera traps were deployed, covering an area of 347 km^2, to estimate the population of tigers in Pench Tiger Reserve between March and June 2010 (n = 4000 trap nights). In total, 44 line transects were walked seven times during the summer of 2010 (total effort 938 km) to understand the availability of prey to tigers in Pench Tiger Reserve. Thirty-six kills were recorded in the study carried out to understand the food habits of tigers.

Outputs and Outcomes

The estimated annual home range of the adult female was 34.2 km^2 (n = 401) and that of the sub-adult male was 54.2 km^2 (n = 755). During October 2010, the radio-collared tigress delivered five cubs, and her estimated home range after the first 6 months of the cub raising period was 20.4 km^2 (between October 2010 and March 2011). The estimated population of tigers in the study area as estimated using the Mh-jackknife model was 34 ± 6.2, and the density estimated using the maximum likelihood model was 3.9 ± 0.5/100 km^2.

The estimated individual prey species densities showed that the common langur was the most abundant prey species in the study area (96 ± 9.8 SE/km^2), followed by chital (69.2 ± 11.4 SE/km^2 in summer), wild pig (13 ± 1.4 SE/km^2), sambar (10 ± 1.2 SE/km^2), nilgai (2.4 ± 0.3 SE/km^2) and gaur (2 ± 0.6 SE/km^2). The estimated mean biomass for six potential prey species was 7108.4 ± 1143.8 kg/km^2

where chital contributed maximum followed by gaur, sambar, common langur, nilgai and wild pig. Of 36 kills made by tigers, adult male chital contributed the maximum (27.7%), followed by chital fawn, adult male sambar, adult female nilgai and adult female sambar (both 8.3%), adult female chital, wild pig and sambar fawn (all 5.5%) and gaur and common langur (both 2.8%).

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

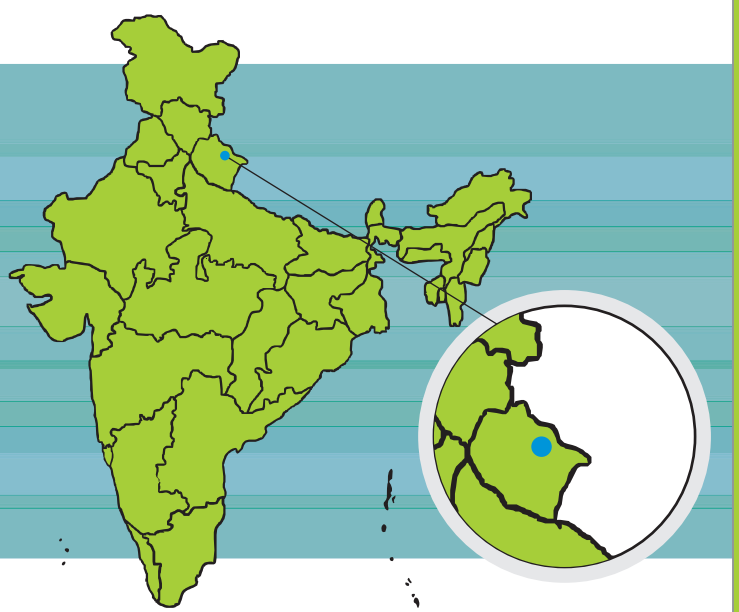
Funding source
Grant-in-aid

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

Researchers
Ashi Qureshi and Pariva Dobriyal

Date of initiation
January 2007

Date of completion
January 2012



Objectives

This project aims to develop an integrated plan to reduce the vulnerability of local communities to environmental degradation in the western Himalaya.

The major objectives of the project are to :

(a) Enumerate the key ecosystem functions of the western Himalayan forested landscape and estimate their value (carbon sequestration, water retention, nutrient retention, landslide and erosion prevention and recreational value).

(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 the vulnerability of the people.

(d) Identify ecosystem management actions and sustainable livelihood options that may reduce the vulnerability of communities to environmental degradation.

(e) Promote the integration of this approach into emerging policy frameworks for sustainable use of natural resources in the region.

Progress

The value of the carbon stock, nutrients, water content and recreation was estimated using standard methodologies in different land use and land cover classes (LU/LC). The plot method was followed to estimate the carbon content. 10 × 10 m plots were laid in 11 sites. The site selection was based on the forest type and slope. Above ground biomass, below ground biomass, litter, soil organic carbon and volumetric soil moisture content data were collected in these plots. Soil samples were collected from different depths (0-30 cm) in smaller plots within the plots laid for vegetation sampling. Chemical analysis was carried out in the laboratory to determine the nutrient content in soil samples. Time-domain reflectometry (TDR) was used to estimate the volumetric soil moisture content. To estimate the recreational value, three sites were selected (Badrinath, Auli and Valley of Flowers National Park). The area individual approach to travel cost method was used, and tourists were interviewed. To assess the socio-economic profile

and human wellbeing, an interview based questionnaire survey was administered in 20 representive villages (700 households).

Outputs and Outcomes

Total carbon content in different LU/LC

The total carbon per hectare was highest in the oak forest (33546.0 t C ha^{-1}), followed by conifer mixed forest, oak pine forest and blue pine forest. The carbon content was lowest in deodar forest and in chir pine forest (405.9 t C ha^{-1}). Among the three human modified areas, plantations were better in terms of their ability to stock carbon (829.1 t C ha^{-1}), followed by orchards and agricultural fields (224.41 t C ha-1 and 201.85 t C ha^{-1} respectively).

There was a significant difference in the carbon stocks of degraded and non-degraded forests ($p < 0.05$). The carbon stock in oak forests, conifer mixed forests and pine forests, was higher in non-degraded forests than in degraded forests. In blue pine and deodar forests, there was no difference in the carbon stock values for degraded and non-degraded forests, whereas the trend was the opposite in chir pine forests, with the carbon stock being higher in degraded forests than in non-degraded forests.

Volumetric soil moisture content in different LU/LC

Among the six different forest types studied, the highest percentage of soil moisture was in oak forest (39.47 %) followed by oak pine forest, conifer mixed forest, blue pine and deodar forest, whereas the volumetric soil moisture content was lowest in chir pine forest (2.45%). Alpine grassland absorbed more moisture (38.84%) than did scrubland (20.72 %), whereas low altitude grasslands were less efficient in terms of soil moisture accumulation (12.32 %). Agriculture (28.79%) had the highest moisture content, followed by orchards (17.25%) and plantations (19.11%).

There was a significant difference between the volumetric soil moisture contents of the degraded and non-degraded forest types of the biosphere reserve ($p < 0.05$).

Significant Findings

The study was conducted in Nanda Devi Biosphere Reserve (NDBR), located in Chamoli, Pithoragarh and Almora districts. The carbon stock was estimated for 12 LU/LC cover types. The findings of the study revealed that different LU/LC store different amounts of carbon in different strata. Natural forests are more effective in terms of carbon storage than are human modified landscapes such as orchards, crop fields and plantations. The oak forest is the largest storehouse of carbon, followed by conifer mixed, oak pine, blue pine, deodar and chir pine forests. Amongst the alpine meadows, the low altitude grasslands are less carbon efficient than are their counter parts, the high altitude grasslands. Mountain scrublands were found to be more carbon efficient compared with both low and high altitude grasslands. Human modified landscapes varied in their carbon storage ability, with the highest carbon storage being in plantations, followed by orchards and agricultural fields.

Examination of the volumetric soil moisture contents of 12 LU/LC of NDBR revealed that the natural forests were rich in moisture content compared with grasslands, scrublands and human modified landscapes. The volumetric soil moisture was highest in the oak forest followed by the oak pine, conifer mixed, blue pine and deodar forests. It was lowest in the chir pine forest of the biosphere reserve. The high altitude grasslands are more soil moisture efficient than the low altitude grasslands. Plantations are found to be least efficient in terms of water yield. A study of the volumetric water yield revealed that streams in conifer mixed forests had the maximum runoff, while it was least in the streams in oak forests because the water holding capacity is higher in an oak forest.

The assessment of the provisioning services and human wellbeing revealed that the annual household income of local communities was higher for households living away from the forests compared with those households living near the forest. There was no significant difference in the educational level and access to basic amenities of the households living near and away from the forest. The contribution of forest products to the annual household income is higher for the households located near the forest compared with the households away from the forest. The oak forest contributes most to the income, while the deodar forest contributes the least. There is no significant difference in wellbeing between the households living near and away from the forest, but the contents of the well-being are different.

The recreational value was estimated using the travel cost method. Four sites were selected on the basis of the tourist visitation rate per year. Two sites were selected for recreational and adventure tourists and two sites were selected for religious tourists. A total of 570 personal interviews were conducted with tourists. The consumer surplus was higher for recreational and adventure visits than for religious tourism.

The results are relevant for national inventories of carbon stocks and in predicting water requirements in the Himalaya for effective planning and management in water allocation. The study provides insights for managing forested ecosystems and

private lands in accordance with the type and level of ecosystem service needed. Recreational services can be developed as alternative livelihood options and so can be used to reduce the dependency on forest resources. This is relevant to the sustainability of mountain communities and can be used for management and planning of provisioning and recreational services.

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

Funding Source
Grant-in-aid

Investigators
Dr. S.P. Goyal, Dr. K. Sankar and Shri Q. Qureshi

Researchers
Randeep Singh and Puneet Pandey

Date of Initiation
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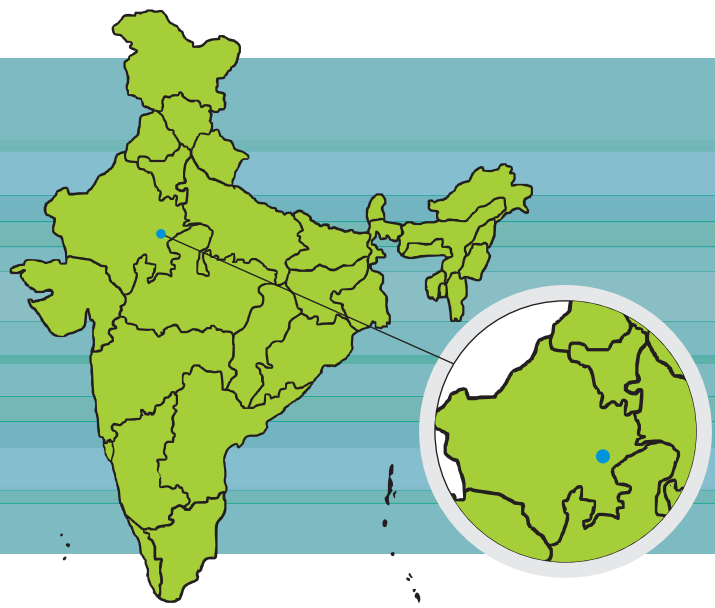
Date of Completion
September 2011



Objectives

This study was based on standardized protocols for tiger population estimation using non-invasive techniques developed in Phase I (October 2005 to March 2007). Phase II of the project aims to :

(i) Determine the tiger population using pugmark and camera trap (sight and re-sight) techniques and non-invasive DNA based techniques using scats and remotely collected hair from an intensively studied area of ca. 150-200 km^2 in Ranthambore Tiger Reserve, Rajasthan.

(ii) Compare tiger estimates determined by various methods and seasons with respect to precision and accuracy and suggest appropriate protocols which are practical, suitable at a variety of scales and cost effective for estimating tiger numbers in dry tropical habitats.

Progress

The study area was divided into 1 × 1 km^2 grid based on tiger tracks and signs. A total of 224 grids were selected, covering an area of 233 km^2. Placement of camera traps was done systematically in these grids. Each grid has a camera trap and track plot (TP). The intensive study area (ISA) was sampled in a phased manner in consecutive blocks, deploying 48 to 65 camera traps in winter. Each camera trapping station was operated for 15-20 days during the study period. Owing to the good network of roads, all the trapping sites in each of the study periods were checked twice in a week. Scats were collected intensively in the ISA. The ISA was divided into 27 road segments, covering a distance of 161 km. Each survey was considered as one sampling occasion. Five replicate surveys or sampling occasions were carried out. DNA was extracted from the scats collected using the commercially available QIAamp® DNA Stool Mini Kit (QIAGEN, Germany) using the manufacturer's protocol. DNA was extracted and visualized on 0.8% agarose gel to assess the quality and quantity.

Outputs and Outcomes

During 60 days of trapping in three spatially separated blocks with a total sampling effort of 3720 camera trap nights (186 traps × 20 days), a total of 176 photo-captures of 23 individual tigers were made. The estimated effectively sampled area (ESA) was 397 km^2 for all individuals, while the ESA

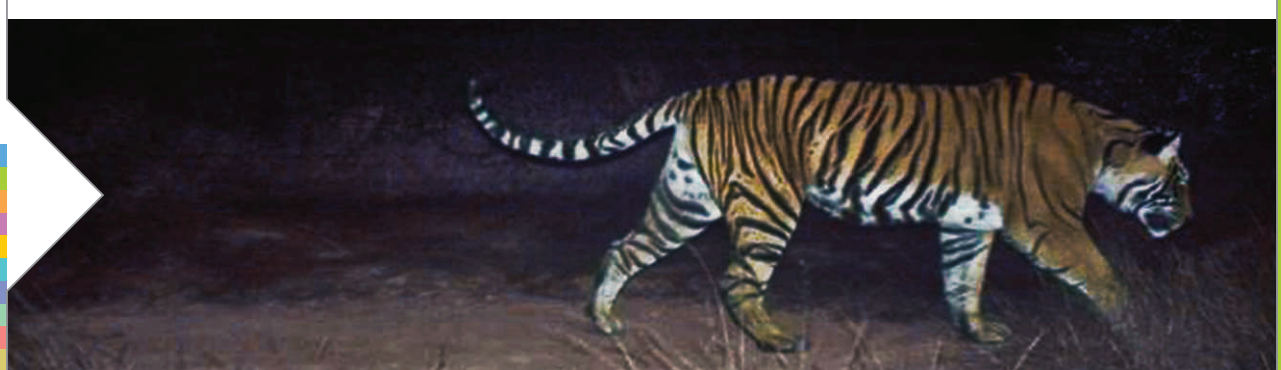
of male tigers was 420 km^2 and that of female tigers was 394 km^2, using ½ MMDM. In all in 44 scats tiger origin were confirmed.

Milestones

Assessment of the abundance and genetic diversity of threatened and endangered species helps in formulating conservation strategies. The actual density and distribution pattern of male and female tigers was known through the use of camera traps, with the sex ratio being 1:1.3 (male: female). During sampling from November 2010 to February 2011, a total of nine cubs were captured in the camera traps. Scat samples were used for gender identification as well as individual identification, and the genetic diversity of the tiger population was assessed. Finally 15 highly polymorphic microsatellite loci were initially selected for genotyping of scats, including seven species specific microsatellite loci and eight other heterologous microsatellite loci.

The selection of primers was based on the amplification success rate with scats and the extent of genotyping errors such as allele dropout, false alleles and level of polymorphism shown by these markers in the tiger. For the purpose of individual identification, five to seven loci were found to be sufficient.

Camera trap Photographs



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
Ishwari Dutt Rai, Sabuj Bhattacharya and Rupesh Ranjan Bharti

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Date of completion
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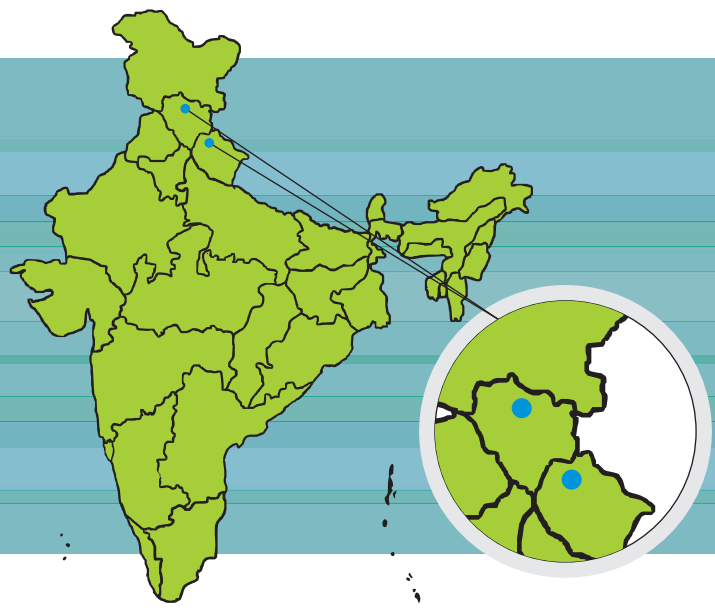

Objectives

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 interspersion) using remote sensing and GIS.

(v) Develop models for predicting future situations along sub-alpine-alpine ecotones in the event of climate change and continued anthropogenic pressures.

Progress

During the reporting period, the study focused on structural and functional aspects of timberline vegetation, selected indicator species of flora and spatio-temporal changes in the timberline. Generally, timberlines that are distinguishable in the study area are :

(i) Anthropogenic timberlines (pressures mainly from prolonged grazing and excessive fuelwood consumption and having potential for growth of tree species towards higher slopes from the edge).

(ii) Orographic timberlines (steep rocky slopes and glaciated valleys give rise to abrupt termination, and tree growth is checked well below the potential altitude for growth due to the effects of winds and frost).

(iii) The naturally protected timberline (more or less protected and having good regeneration of tree species along the edge).

Strong evidence of impacts of inter-annual climatic variations on the phenology of the selected tree species has been documented. The study reveals that there was a trend of earlier occurrence of phenophases in the third consecutive year. *Rhododendron arboreum* is one of the broad range of

tree species of the study and it was well adapted to climatic fluctuations. In 2010, due to higher air and soil temperatures, flowering was initiated earlier than in the previous two years in *Rhododendron arboreum* and finished earlier. The timing of full flowering stages overlapped, while in *Rhododendron campanulatum* the full flowering phenophase did not overlap in these three years, and there was advancement in the timing of flowering due to the more favourable temperatures for growth in March-April. In *Betula utilis* the early start of growth gives sufficient time for maturity of the tissues and for the reproductive phase. In autumn, senescence causes slight shrinkage of the leaf margins and hence a decrease in the leaf area. The leaf fall was largely concentrated in mid-August and September, when there is a rapid decrease in the soil and air temperatures. A delayed leaf fall was noticed in 2010 due to growth during a prolonged monsoon.

Outputs and outcomes

Analysis of the temporal dynamics of the timberline over the last three decades suggests that there is no significant change in the upper limit of the timberline. However, indications of changes in the community structure have been found in a few sites, and a strong relationship between level of disturbance and decrease in canopy cover has been found. Decreases in vegetation cover were noticed both within and outside protected areas; however, a comparison suggests that overall the protected areas have experienced a greater decrease compared with non-protected areas.

The maximum decrease in NDVI within protected areas was noticed at Govind National Park (NP), followed by Kedarnath Wildlife Sanctuary (WLS) and Gangotri NP. A total increase in canopy occurred within protected areas, with Gangotri NP showing the maximum increase, followed by Govind NP and Kedarnath WLS. Area statistics based on analysis of remote sensing data reveals that the mixed oak-conifer forest is the largest vegetation community at the timberline. However, classification experience indicates that defining the criteria for discrimination of the pure oak class from mixed oak based on a proportion threshold is difficult to achieve at this scale. The birch community is relatively easy to discern due to its phenological differences from other vegetation classes, and the only source of error is the vigorous growth of herbaceous vegetation at the peak of the growing season. The pattern of change noted using the image differencing technique is in accordance with field observations at a few sites, while the changes observed at many sites are not according to expectations and are still to be verified.

Significant Findings

The important findings are the following

(I) Increase in canopy cover is greater at lower elevations as compared with at the upper limit of the timberline.

(ii) There is no significant difference in increase in canopy between protected and non-protected areas, while decreases occurred more within protected areas.

(iii) A more heterogeneous change above 3400 m at a few sites indicates changes in either community structure or recruitment of new individuals at higher elevations.

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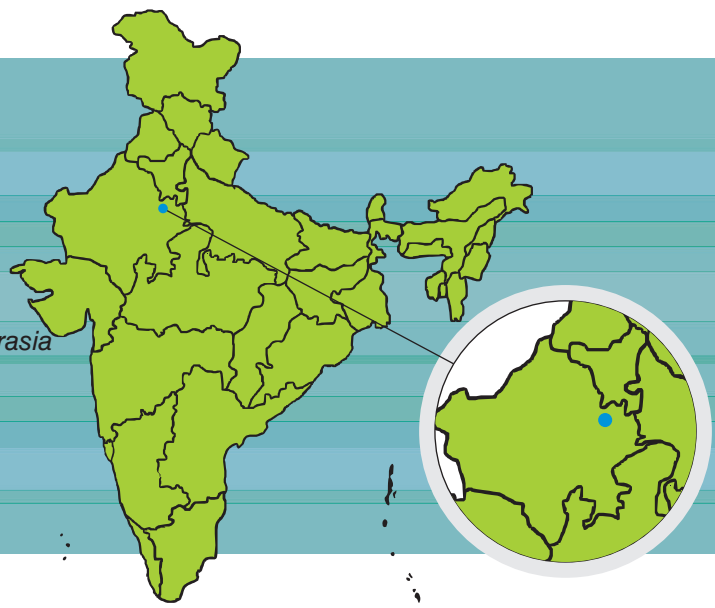
Ecology of Leopard in Sariska Tiger Reserve, Rajasthan



Funding source
Grant-in-aid

Investigators
Dr. K. Sankar, Shri Qamar Qureshi and Dr. Y.V. Jhala

Researchers
Krishnendu Mondal and Pooja Chourasia

Date of initiation
September 2007

Date of completion
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 pattern of the leopard

(iv) Develop a conservation action plan for the leopard in semi-arid landscapes.

Progress

To understand the home range and ranging pattern of the leopard, two individuals have been radio-collared so far. One male leopard (SP2) was monitored during the reporting year. A male leopard (L2) was radio-collared on October 28, 2009. In total, 259 locations were recorded using the 'homing in' and 'triangulation' techniques from this individual till it was lost after August 16, 2010. Information on the major vegetation type, terrain type and distances to nearest water source, human habitation and road were also collected on each leopard location. The home range was estimated using Mapsource, GPS Trackmaker and ArcGIS 9.2. In total, 115 trap nights were deployed to capture free ranging leopards in the study area using trap cages, but no leopard could be captured during the reporting period. To estimate the prey availability, prey selection and food habits of the leopard, line transect sampling and scat analysis of leopard were carried out. In total 32 line transects were walked thrice in the study area. The total length of transects was calculated to be 58 km, and total effort was 195 km of walking. To study the food habits, 82 leopard scats were collected, washed and analysed to identify the prey remains. In total, 93 leopard kills were recorded.

To estimate the population density, survivorship and demographic details of leopards in the study area, photographic capture-recapture techniques were used. The study area was divided into two blocks of area 80 km^2, and a pair of camera traps was placed in a 2 km × 2 km grid. 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 in each grid. The density of leopards was estimated using DENSITY 4.1. In total, 40 trapping stations

were camera trapped, covering a minimum convex polygon (MCP) of area 118.7 km^2 and an effective trapping area of 250.6 km^2.

Outputs and Outcomes

With a 100% MCP, the estimated home range of the male leopard SP2 was 170.1 km^2. With a 90% kernel, the estimated home range of SP2 was 54.6 km^2. The home range estimate with a 50% kernel, which was the core-area within the home range, was 7.9 km^2 for SP2. The seasonal home ranges were also estimated using the MCP method. The summer home range of SP2 was 56.9 km^2, the monsoon home range was 13.6 km^2 and the winter home range was 170.1 km^2.

The abundance of prey species was estimated through line transects using DISTANCE 5. The selected model for summer was half normal with cosine adjustment 2 (P = 0.70194, chi-square = 0.6798, and degrees of freedom = 2), and in winter it was half normal with cosine adjustment 2, 3 (P = 0.75545, chi-square = 0.0970 and degree of freedom = 1). The total number of walks was calculated to be 96, with a total effort of 195 km of walking in each season. In summer, the peafowl was found to be the most abundant (130.0/ km^2) prey species in the study area, followed by goat, nilgai, domestic cow, chital, sambar, common langur, wild pig and hare. In winter, domestic cow was found to be the most abundant (58.6/km^2) prey species, followed by peafowl, chital, nilgai, common langur, sambar, wild pig and hare.

Scat analysis revealed that the sambar was the principal prey species of the leopard in terms of number and biomass. Sambar and chital together contributed 50% to the diet of the leopard. Ten prey species were identified from leopard scats. The percentage frequency of occurrence in leopard scats was the highest for the sambar (33.7%), followed by chital, cattle, common langur, peafowl, nilgai, rodent, wild pig, porcupine and hare. The prey preference of the leopard was in the following order: common langur > sambar > chital = cattle = nilgai > peafowl. The leopard kills recorded were largely from the peripheral areas of Sariska National Park or areas outside it. The kill data revealed that

Camera trap photograph

the goat was the principal prey, followed by cattle, nilgai, sambar, chital, sheep, common langur, buffalo and dog.

Milestone

In total, 34 leopard photographs were captured, and from which eight individuals were identified. The MCP area of the sampled area is 118.7 km^2, and the effective trapping area is 250 km^2. The data were analysed using CAPTURE and DENSITY 4.1. Heterogeneity (Mh) estimation was selected as the appropriate model. The estimated population of leopards was 9.0 with SE 1.5. The estimated density of leopards was 3.1/100 km^2 with SE 0.4 in MCP with the 1/2 MMDM model, while it was 3.4/100 km^2 with SE 1.3 in the inverse prediction model.

Significant Findings

To understand the home range and ranging pattern of the leopard, two individuals were radio-collared. These animals were captured from conflict areas outside Sariska Tiger Reserve and released inside the tiger reserve. A total of 148 locations were collected from the first male leopard (SP1). A total of 268 locations were collected from the second male leopard (SP2). A few studies have reported that large cats show a 'homing' instinct when they are translocated to a forested habitat (Athreya 2011). But in the present study, both the leopards did not show a homing instinct. These two leopards preferred remaining in forested habitats to going back to a highly disturbed human dominated landscape. The home range of the male leopard SP1 was 84.3 km^2, and that of the male leopard SP2 was 170.1 km^2.

All tigers in Sariska Tiger Reserve got exterminated in 2005. Subsequently, six tigers were re-introduced in Sariska during 2008-2011. We compared the abundance, site occupancy and temporal activity patterns of the leopard before and after tiger re-introduction.

The camera trapping resulted in a total of 81 photographs of 17 individual leopards in 2008, 64 photographs of 14 individual leopards in 2009 and 31 photographs of eight individual leopards in 2010, based on the number of individuals identified from their rosette patterns. The leopard population (N) was estimated at 17.9 ± SE 3.0 in 2008 (before tiger release), 16.3 ± SE 3.3 in 2009, 9.0 ± SE 1.5 in 2010 (after tiger release) and 14.1 ± SE 3.1 in 2011. The density of leopards estimated using the maximum likelihood approach was 8.0 individuals/ 100 km^2 (SE 2.0) in 2008 (before tiger release), 5.7 individuals/100 km^2 (SE 1.5) in 2009, 3.3 individuals/100 km^2 (SE 1.2) in 2010 (after tiger release) and 5.1 individuals/100 km^2 (SE 1.8) in 2011.

It was found that the grids with the maximum tiger photo-captures were largely avoided by the leopard, which selected areas where the tiger occurrence was lower. The site utilization of both the species was estimated from site-wise capture records. Before the release of tigers in 2008, the probability of site utilization of leopards was 0.75 in the study area. But after the tiger release, the site utilization of the leopard and tiger were 0.55 and 0.53, respectively, in the absence of either species, while that of both the leopard and tiger together was 0.51.

Leopards were found to be most active in the evening, between 18:00 hours and 21:00 hours, before the tiger release, and the period shifted to the late evening, i.e. 21:00 hours to 00:00 hours, after the tiger release. The tiger showed a bimodal activity pattern with minor and major peaks. The major peak of tiger activity was observed after midnight (00:00 hours) up to 03:00 hours and the minor peak was between 18:00 hours to 21:00 hours. The leopard activity was found to be very low after midnight between 00:00 hours and 03:00 hours, when the tiger was most active.

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

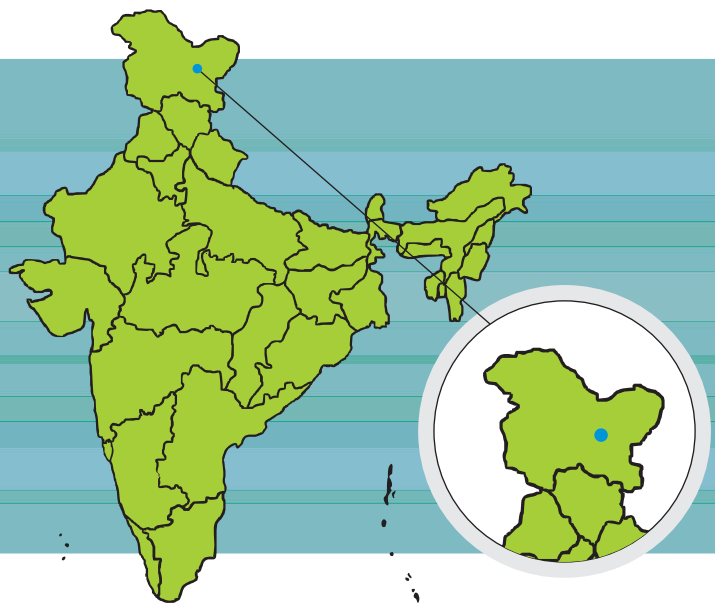
Funding source
Grant-in-aid

Investigator
Dr. S. Sathyakumar

Researchers
Lalit Kumar Sharma and Samina Amin Charoo

Date of initiation
January 2007

Date of completion
January 2012



Objectives

The objectives are to :

(i) Assess the bear-human conflicts and threats to the black bear and its habitats at Dachigam, adjacent reserve forests and protected areas in the north-western 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 (NP)

(iii) Determine whether the daily, seasonal and annual activity, habitat utilization, and movement and ranging patterns of the Asiatic black bear at Dachigam NP are influenced by the availability and distribution of the major food plants of Dachigam NP.

Progress

Fieldwork continued during the reporting year on the distribution of the Asiatic black bear, its relative abundance and habitat use by the black bear based on direct and indirect evidence. Lower Dachigam (*ca*. 90 km^2) was selected as the intensive study area and divided into 23 grids (2 × 2 km^2), and in each grid, one camera and hair snare station were placed. In all, 13 transects/trails were used covering all the grids in the study area to record bear sightings and signs. In total, 141 permanent vegetation plots were laid along these transects and in the riverine habitat along the Dachigam stream to quantify habitat variables. These transects covered an altitudinal range from 1,600 m to 2,700 m and different aspect and slope categories. Data on the phenology of major food plants in permanent plots were recorded on a regular basis. Six bears (three females and three males) were fitted with VHF + GPS ARGOS collars in late summer and autumn in 2009 and monitored regularly.

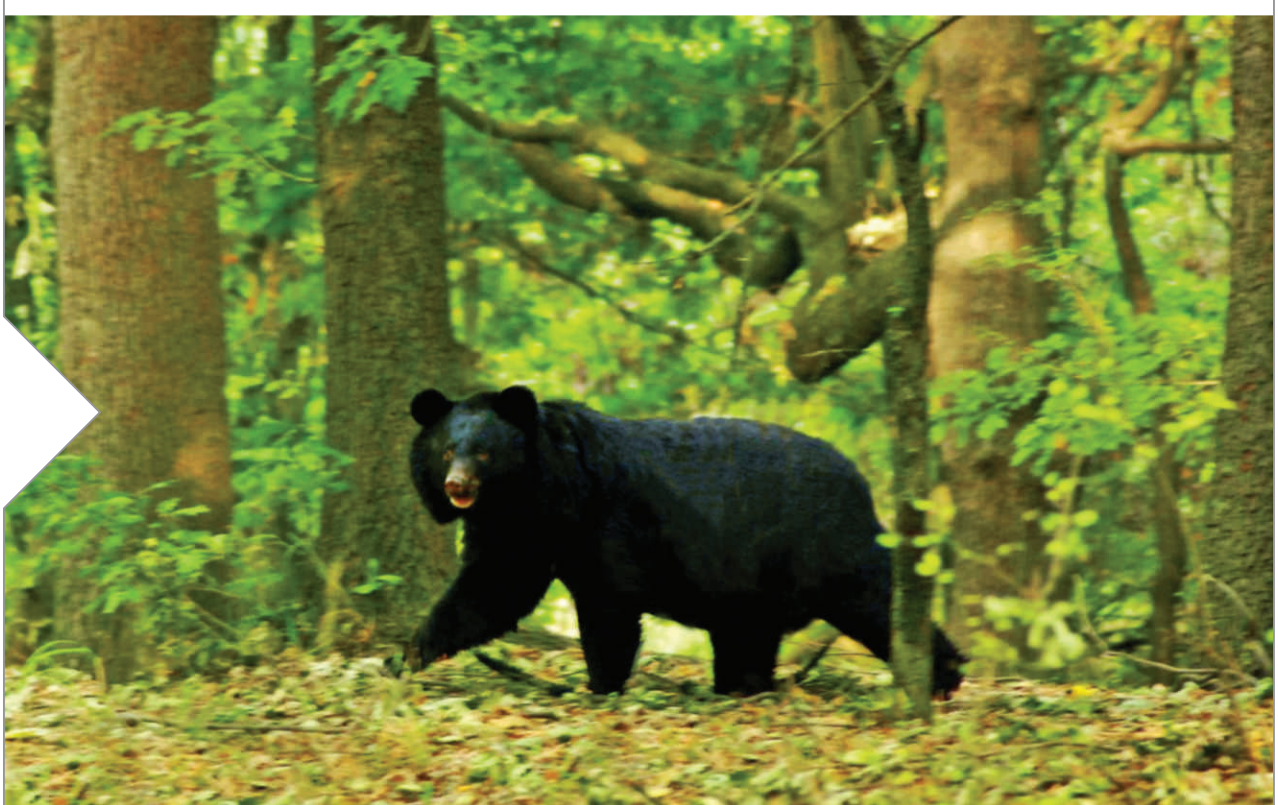
Outputs and Outcomes

Based on telemetry data, information on the movement and ranging patterns and hibernation periods has been obtained. Information on den sites of collared bears and a few other unmarked bears was collected. The hibernation period of collared bears ranged from 45 to 90 days. During tracking of collared bears from autumn 2009 to winter 2010, 1,301 locations were obtained. The data for three

collared bears (one male and two females) for the period autumn 2009 to autumn 2010 were generated using the 95% kernel and 100% MCP methods. The 95% kernel home range size of F1 was 8.34 km^2 and that of F2 was 68.98 km^2. The home range of the male M1 was the largest, 107.23 km^2. The 100% MCP size of female F1 was 7.2 km^2, that of female F2 was 49.53 km^2 and that of male M1 was 72.20 km^2. The home range size of the female with a cub (F1) was smaller than that of the solitary female (F2), and it was largest for the male (M1). The female with a cub (F1) restricted her movements to within the natural habitat inside Dachigam NP, whereas the other, solitary female (F2) and the adult male (M1) used areas outside Dachigam NP substantially. The home range estimated by the kernel method was larger than that estimated by the 100% MCP method. The degree of home range overlap, estimated by the MCP method, of the male (M1) during the study period was 3.5% (3.3 km^2) with the female F1 and 9.7% (10.4 km^2) with the solitary female F2. Data on the hibernation period of the black bear were collected using radio-telemetry. The hibernation period of the black bear in Dachigam NP ranged from 40 to 77 days (mean 55.7 ± SD 19.1 days). Continuous investigations on the black bear distribution, population and movement patterns using camera traps, satellite telemetry and non-invasive DNA analysis are proposed.

Milestone

For the first time in India, six Asiatic black bears have been successfully live-captured, immobilized, radio-collared and are being monitored through the ARGOS satellite system as well as using VHF.



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

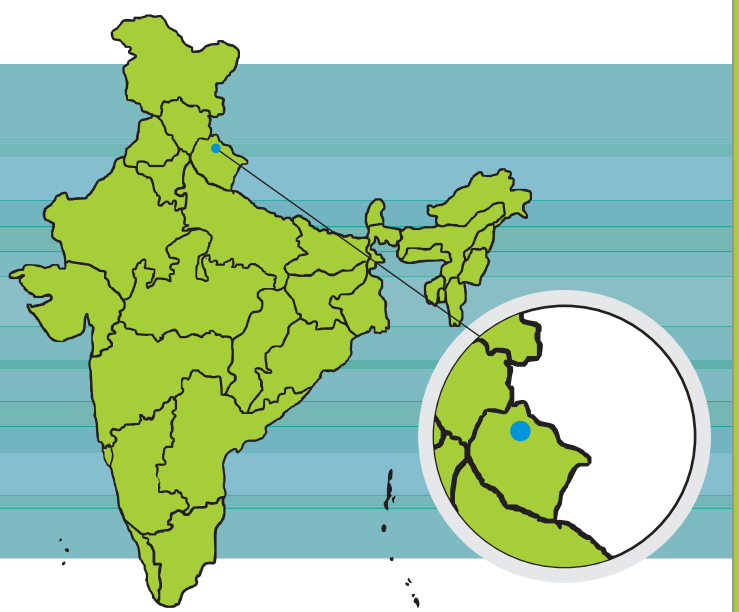
Funding source
Grant-in-aid

Investigator
Dr. V.P. Uniyal

Researchers
Manish Bhardwaj
and Abesh Kumar 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 beetles and butterflies

(iv) Suggest and develop long-term management strategies for conservation of invertebrate diversity in the landscape.

Progress

Sampling plots were laid at 28 major sites in different elevation zones for butterflies and moths along two disturbance gradients in Govind National Park and Wildlife Sanctuary during 2010-2011. The elevation varied from 1,200 m up to 3,500 m a.s.l. Four watersheds, namely Kedar Kanta, Istragad, Jakhol and Hari-ki-Dun, which represent western Himalayan habitats, were sampled for major insect orders. A total 230 plots for butterflies and 86 plots for moths and beetles were monitored in three seasons. Vegetation and disturbance parameters were quantified on the same plots to determine the influence of these factors on species diversity parameters (species richness, abundance and diversity).

Output and Outcomes

A total of 912 morphospecies falling in two major insect orders were collected from the study area. A total of 121 butterfly (*Rhopalocera*) species from 82 genera and five families, 174 moth (*Heterocera*) species from 18 families and 120 species of beetle (*Coleoptera*) from 62 genera and 13 families have been identified so far. The species richness decreases with elevation with multimodal peaks between the elevation zones of 1,200-1,800 m a.s.l. (for butterflies) and 1,800-2,200 m a.s.l. (for moths). The highest species richness and diversity were recorded in mixed riverine forest and broadleaf forest for all taxa. The butterfly and moth species richness was observed to be positively correlated with the plant species richness. Disturbance parameters such as livestock abundance and fire

signs were major negative predictors of insect diversity.

Milestone

The current study has documented 34 new species of moths for Uttarakhand state. The diversity and distribution patterns of beetles, butterflies and moths have been documented along with how anthropogenic factors affect the species distributions in the Gangotri Landscape. A night trapping protocol for sampling moths in remote and high altitude areas has been developed which can be followed in other similar areas with limited resources and logistics.

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A Study on Sympatric Carnivores *(Tiger, Leopard and Wild Dog)* in Mudumalai Tiger Reserve, Tamil Nadu

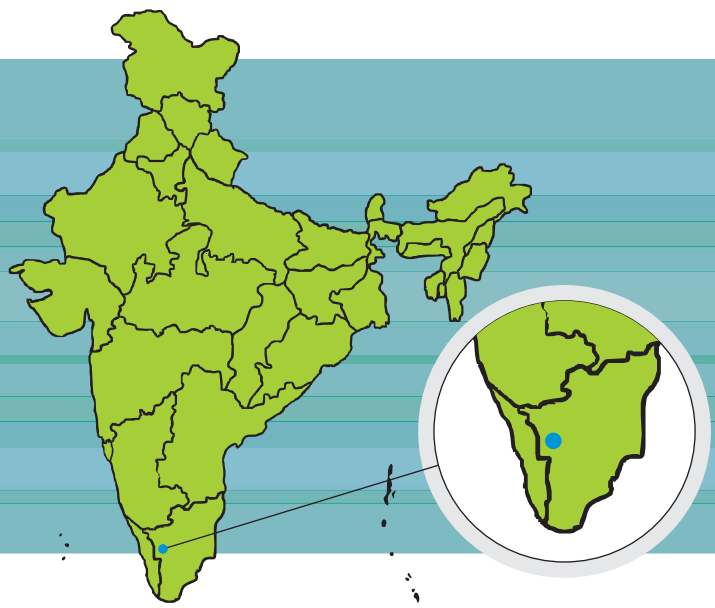
Funding Source
Grant-in-aid

Investigators
Dr. K. Sankar and
Shri Qamar Qureshi

Researchers
T. Ramesh and Riddhika Kalle

Date of Initiation
January 2008

Date of Completion
July 2011



Objectives

The objectives of the project are to :

(i) Estimate the density, distribution, group size and composition of prey species of sympatric carnivores (tiger, leopard and dhole)

(ii) Study the food habits and prey selectivity of sympatric carnivores

(iii) Estimate the populations of sympatric carnivores

(iv) Study the distribution of sympatric carnivores and their prey species with special reference to anthropogenic pressure.

(v) develop a conservation action plan for these sympatric carnivores.

Progress

Line transects (n = 33) were laid in the intensive study area (187 km^2), covering the major vegetation types (deciduous (DD), semi-evergreen (SE) and dry thorn (DT)). For each potential prey species detection, the time, species, group size, group composition, animal bearing (using a hand held compass) and angular sighting distance (using a laser range finder) were recorded. The prey species population was estimated using Distance 6.0.

Fresh scats of tiger, leopard and dhole were collected whenever encountered along pre-determined forest roads and trails in the study area. A total of 1,100 tiger scats, 506 leopard scats and 1,438 dhole scats were collected during the study duration. Scats were washed, sun dried and processed for further analysis. The dietary overlap between the tiger, leopard and dhole was estimated using Pianka's overlap index.

In order to assess the populations of the tiger and leopard, the study area was divided into 3 × 3 km^2 grids, and within each grid a pair of cameras was deployed. Camera trapping was carried out for 3 years in the study area to estimate the tiger and leopard populations. Every year camera trapping was carried out for at least 40-70 days. The number of camera trapping sites in DD, SE and DT was 20, 17, and 13, respectively. Data were analysed using DENSITY 4.4 and SPACECAP to estimate the tiger and leopard populations using the capture-recapture method. Five vehicle transects ranging in length from 15 to 23 km were monitored in the early morning and late afternoon, amounting to a total

effort of 4,496 km. On each sighting of dholes along vehicle transects, the following information was recorded :

(1) Total number of individuals.

(2) Perpendicular sighting distance. The density of wild dogs was calculated using Distance 6.0.

For studying the distribution of sympatric carnivores and their prey species with specific reference to anthropogenic pressure, Theppakadu, Kargudi, Mudumalai and Kapur villages were surveyed. Anthropogenic data (wood cutting, lopping, grazing, livestock dung, and minor forest produce collection) were collected from every 400 m sampling point around a 10 m radius along the line transects.

Outputs and Outcomes

Fifteen potential prey species were detected on line transects in the study area. The estimated overall prey density was 113.3 individuals/km^2, including wild ungulates (59.4/km^2), arboreal mammals (38.4/km^2), the elephant (4.9/km^2) and others (10.6/km^2). The estimated mean biomass of ungulate prey species was 5,822.4 kg/km^2. The half normal detection function with Hermite adjustment was the best fitted model for the sambar, wild pig and Indian giant squirrel, while the half normal detection function with cosine adjustment was the best fitted model for other species. For elephants, the uniform cosine model was the best fitted model.

Scat analysis revealed the presence of 20 prey species in tiger scats, 21 prey species in leopard scats and 15 prey species in dhole scats, with a high predominance of medium to large sized ungulates in all three species. Of the prey species identified from tiger scats, ungulates constituted the greatest percentage (95.1%), followed by primates (1.9%), cattle (1.6%), buffalo (0.8%) and others (0.6%). Leopard scats had the following remains: 85.0% ungulates, 10.9% primates, 1.8% cattle, 0.2% buffalo and 2.1% others. Dhole scats had these

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remains: 94.0% ungulates, followed by 1.6% primates, 0.3% cattle and 4.1% others. The overall biomass composition of large sized prey (>50 kg) in tiger, leopard and dhole scats was found to be 66.8%, 33.6% and 44.5%, respectively, that of medium sized prey (20 to 50 kg) was 31.0%, 57.0% and 54.7%, respectively, and that of small sized prey (<20 kg) was 2.2%, 9.4% and 0.8%, respectively. Chital and sambar together contributed the bulk of the diet (>77%) of all the three predators. In addition, the gaur and wild pig were important prey items of the tiger in terms of the frequency of occurrence, while the common langur was an important prey item of the leopard, and the black-naped hare and mouse deer were important prey items of the dhole. The dietary niche overlap among predators was high (>80%). Scat data showed that the tiger consumed mostly large sized prey and that the leopard and dhole consumed medium sized prey. The predators entirely depended on wild ungulates.

The camera trapping study revealed 28 individual tigers (seven males, 17 females and three unidentified sex) and 31 individual leopards (11 males, 17 females, and three unidentified individuals) over 40 days of camera trapping in all three sampling habitats. The sex ratio of the tiger was found to be 1 male: 2.4 females, and that of the leopard was 1 male:1.5 females. The densities estimated through a capture-recapture framework using the spatially explicit-maximum likelihood and Bayesian methods in Mudumalai were 9.2 ± 2.4/100 km^2 and 9.5 ± 1.6/100 km^2 for the tiger and 15.1 ± 5.0/100 km^2 and 14.4 ± 2.0/100 km^2 for the leopard, respectively. The total number of tiger photographs was 93 and the number of leopard photographs was 117. The dhole density estimate (individuals/100 km^2) was 37 ± 16, and the number of observations was 31.

Milestone

This study indicates a high availability of different sized prey species, which facilitates the co-existence of these predators through prey choice in Mudumalai Tiger Reserve. This study has provided important baseline information for long-term monitoring of the tiger, leopard and dhole in Mudumalai Tiger Reserve, which is one of the few areas where all three predators occur in high densities and which is most important for conservation of the tiger, leopard and dhole in the Western Ghats.

Significant Findings

The overall density (individuals/100 km^2) estimate of the tiger was 12.1 ± 2.6, and that of the leopard was 17.4 ± 3.7. We estimated 28 individual tigers (seven males, 17 females and four unidentified individuals) and 31 leopards (11 males, 17 females, and three unidentified individuals in the study area. The overall density (individuals/100 km^2) of the dhole was 37 ± 16 individuals.

The estimated tiger density in Mudumalai is the fourth highest in the country, the estimated leopard density is the highest in the country, and the estimated dhole density is the second highest in the country. The study revealed a high availability of different sized prey species, which facilitated the co-existence of these predators through prey choice in Mudumalai Tiger Reserve. This study has provided important baseline information for long-term monitoring of the tiger, leopard and dhole in Mudumalai Tiger Reserve, which is one of the few areas where all three predators occur in high densities and is hence important for conservation of the tiger, leopard and dhole in the Western Ghats.

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

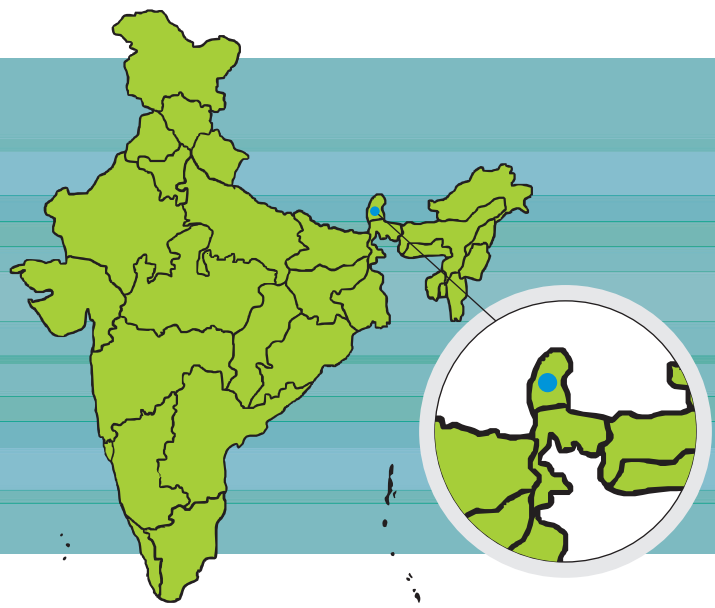
Funding source
Grant-in-aid

Investigator
Dr. S. Sathyakumar

Researchers
Tapajit Bhattacharya, Tawqir Bashir and Kamal Poudyal

Date of initiation
January 2008

Date of completion
January 2012



Objectives

The objectives are to :

(i) Develop a 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 the habitat use patterns of ungulates and galliformes and the food habits of carnivores in Khangchendzonga BR

(iii) Develop a monitoring programme for monitoring 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 2 × 2 km^2 grids, and camera traps have been placed along trails in every grid to obtain data on the presence/absence, relative abundance and population of carnivores, ungulates and galliformes in the study area. Trail sampling and scanning methods were used for collecting data on carnivores, ungulates and galliformes based on direct and indirect evidence. All field activities were carried out in the form of field expeditions involving camping in different areas of the *Prek chu* watershed.

Outputs and Outcomes

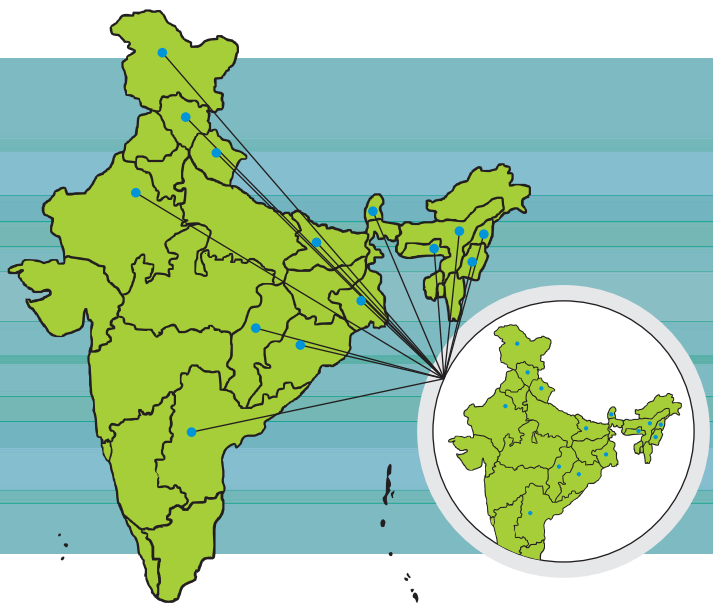
The presence of 19 species of carnivore was confirmed either from camera trap photos or from direct sightings or from indirect evidence encountered during trail walks. The following species were confirmed: Asiatic black bear, red panda, snow leopard, clouded leopard, common leopard, golden cat, leopard cat, jungle cat, red fox, wild dog, Tibetan wolf, golden jackal, Himalayan yellow-throated marten, large Indian civet, Himalayan masked palm civet, beech marten, Siberian weasel, pale weasel and Himalayan yellow-bellied weasel. The encounter rates of 17 carnivore species were mapped according to the forest types found in the intensive study area. Eight species of ungulate and seven species of galliformes were encountered in the study area. Amongst the

ungulates, the goral, barking deer, serow, Himalayan tahr, Himalayan musk deer, black musk deer, blue sheep and wild pig were the species with their presence confirmed through direct and indirect evidence. The distribution of ungulates in different aspects, slopes, habitats and elevation categories in the study area was plotted on a map of the study area, and their encounter rates were mapped according to the forest type of the intensive study area of the confirmed galliformes species are the following: blood pheasant, Himalayan monal, satyr tragopan, kalij pheasant, hill partridge, snow partridge and Tibetan snowcock. The blood pheasant was the most frequently seen pheasant during transects and trail walking. The encounter rates of pheasants and partridges were mapped according to the forest type of the intensive study area. Surveys were carried out in different watersheds of Khangchendzonga BR to investigate the presence of these mammals and galliformes there.

During this study, several methods or combination of methods were used for estimating the abundance of the carnivores, ungulates and galliformes of Khangchendzonga National Park-Khangchendzonga BR. No conventional method was found to be appropriate for estimating the abundance of cryptic, nocturnal and non-identifiable species. However camera trapping and a combination of camera trapping and trail walking were found to be suitable for estimating the relative abundances of these species without incorporating the probability of detection. Distribution maps of 17 mammals and six galliformes species have been prepared. The relative abundances of these species have been mapped according to the forest type of the intensive study area.

Conservation of Red Junglefowl *(Gallus gallus)* in India (Phase II)

Funding Source
Grant-in-aid
Investigators
Dr. S. Sathyakumar, Dr. Rahul Kaul (Wildlife Trust of India), Dr. Rajiv S. Kalsi (MLN College, Yamuna Nagar)
Researchers
Merwyn Fernandes and Mukesh
Date of Initiation
March 2008
Date of Completion
August 2011



Objectives

The objectives are to :

(i) Assess the status and distribution of the red junglefowl (RJF) in India

(ii) Identify pure RJF populations through molecular genetic studies

(iii) Investigate social interactions between wild RJF and domestic fowl

(iv) Propose a conservation action plan for the RJF populations identified.

Progress

RJF spatial patterns in occupancy :

During the reporting period, fieldwork continued on assessing the spatial patterns in occupancy in the western Shivalik landscape at different scales. Classification by landscape attributes such as vegetation cover and topography from high resolution LANDSAT imageries along with ancillary data regarding drainage and human habitations has been initiated. Environmental information and ancillary data regarding drainage and human habitations were collected, and analysis is in progress. Field investigations included trail/transect sampling for RJF abundance estimation and quantification of the availability and use of the habitat and food resources by RJF. Observations on trait characters, breeding and nesting behaviour and interactions between RJF and domestic chicken in the forest-village interface were also made. The RJF distribution was modeled with climatic data and forest cover using Maxent.

RJF conservation genetics :

The RJF samples (wild and captive) and domestic chicken samples that were collected from different parts of the country were analysed in the WII Forensic Laboratory. 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. DNA extracts were genotyped through PCR with 30 highly polymorphic microsatellite markers. The PCRs were carried out in a 10 µl reaction volume, in Applied Biosystem thermal cyclers (2700 and 2720), containing 1× PCR buffer (50 mM KCl, 10 mM Tris-HCl), 1.5 mM MgCl2, 200 µM of each d-NTP, 1.25 µg BSA, 4 pmol of each

primer, 0.5 units of Taq DNA polymerase and 50 to 80 ng of gDNA. 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 (Version 3.7, Applied Biosystem).

The observed and expected heterozygosity estimates were computed and processed using POPGENE. The observed number of alleles and effected number of alleles were also evaluated using POPGENE. Allelic frequencies were utilized for assessing the polymorphic information content (PIC), 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.

Outputs and Outcomes

Thirty loci were successfully genotyped with all DNA extracts, and they were polymorphic across populations. The north-eastern RJF population showed the highest polymorphism and extensive genetic diversity, with Ho=0.5747, while the central RJF population showed the lowest polymorphism, with Ho = 0.1818. The number of alleles among five RJF populations and one domestic chicken population across all loci ranged between 10.166 and 1.454, and the number of effective alleles ranged from 4.63 to 1.38. The number of observed private alleles among five RJF populations and one domestic chicken population for all 12 microsatellite markers ranged from 32 to 0. The maximum number of private alleles (n = 32) were found in the northern RJF population, followed by the domestic chicken population (11 private alleles), while no private allele was found in the central RJF population.

The mean genetic identities (MGI) and mean genetic distances (MGD) between the domestic chicken population and the five RJF populations ranged from 0.244 (north-eastern RJF population) to 0.406 (central RJF population), 0.783 (north-eastern RJF population) and 0.666 (central RJF population).

In total, 310 RJF and 76 domestic chicken samples were collected, and good quality gDNA was isolated in good quantities. The north-eastern RJF population seems to be the most admixed with the domestic chicken, which may be due to the region being the centre of domestication. The central RJF population seems to be genetically the farthest from the domestic chicken.

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

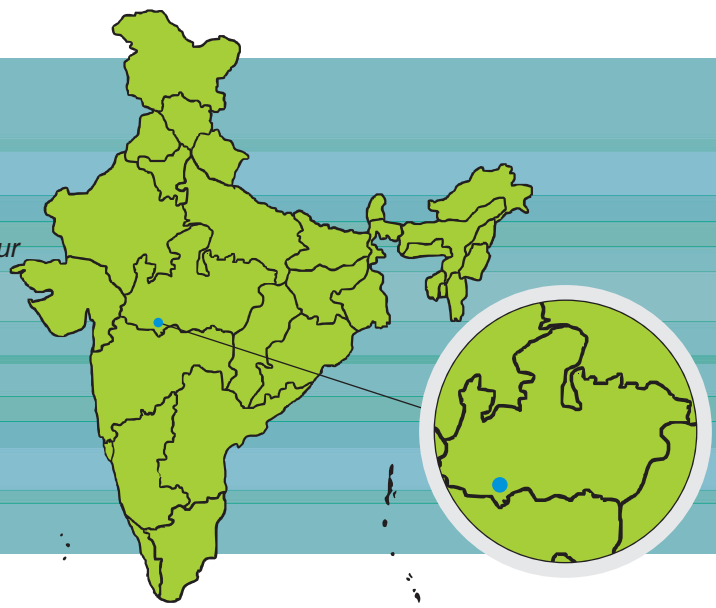
Funding Source
Grant-in-aid

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

Researcher
A. Pragatheesh

Date of Initiation
April 2008

Date of Completion
March 2012



Objectives

The objectives of the project are to :

(i) Assess the nature of ecological effects associated with roads based on a 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 laning) project with and without mitigation measures

(iii) Evaluate the effectiveness of mitigation proposed based on a study of a road project implemented earlier

(iv) Suggest effective measures for preventing road induced impacts to harmonize conservation and development.

Progress

During the reporting period, field observations continued on National Highway 7 in Pench Tiger Reserve. Information on habitat features (vegetation type and structure, slope, water availability and anthropogenic disturbance) and the presence of animal species along the road corridor was recorded using 26 line transects in all three seasons for the second year. Data on road kills were collected from 430 days of observation. The use of underpasses was assessed using the pugmark impression pad method (n = 270) and camera traps (n = 135).

To address the third objective of the study that involved evaluation of the status of following up on the mitigation measures proposed in the earlier study conducted by WII, the WII team visited the Mumbai-Pune Expressway in December 2010.

Output and Outcomes

National Highway 7 (Pench Tiger Reserve) :

The use of roadside habitats by wild ungulates varied seasonally. The encounter rate of ungulates was low within 600 m of the road verge in winter and high within 1 km in summer. During the monsoon, animals were found to be randomly distributed. The availability of water appeared to influence the use of the habitat by the animals along the road. Biotic pressures extended up to 600 m beyond the road verge. The traffic intensity, based on a 24 hour cycle,

varied between 2,620 and 3,382 vehicles/day. A total of 1,035 road kills were recorded in the 9.2 km stretch of the road passing through Pench Tiger Reserve. The frequency of road kills was the highest for reptiles (47%), followed by mammals (21%), amphibians (18%) and birds (14%). Fifty-two percent of the animals were killed during the monsoon, 34% during summer and 14% in winter. Of the 36 underpasses located in a 9.2 km stretch, nine were used by mammals such as the jungle cat, wild pig, porcupine, palm civet, hanuman langur and rhesus macaque. The topography, location and size of the underpasses influenced their use.

Mumbai-Pune Expressway :

The following observations were made after monitoring compliance with the mitigation measures proposed by WII in its earlier report of 1998 :

(i) The realignment of the expressway by merging the expressway with NH 4 in the Lonavala stretch as proposed by WII was done to avoid impacting the lake severely.

(ii) In the entire 92 km stretch of the expressway, only six out of the eight tunnels proposed were constructed. The locations of most of these tunnels did not follow the plan suggested by WII.

(iii) The disposal of debris generated during tunneling was not in accordance with the proposed muck disposal plan, as is evident from the huge mounds of muck located by the sides of the tunnels.

(iv) The proposal to establish Father Santapau Sanctuary has not made any progress.

(v) Although an efficient monitoring system has been put in place by the project authorities to ensure regular movement on and maintenance of the expressway, it was observed during the survey that the fence was tampered at several places, leading to free access to wild animals, cattle and pedestrians.

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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)

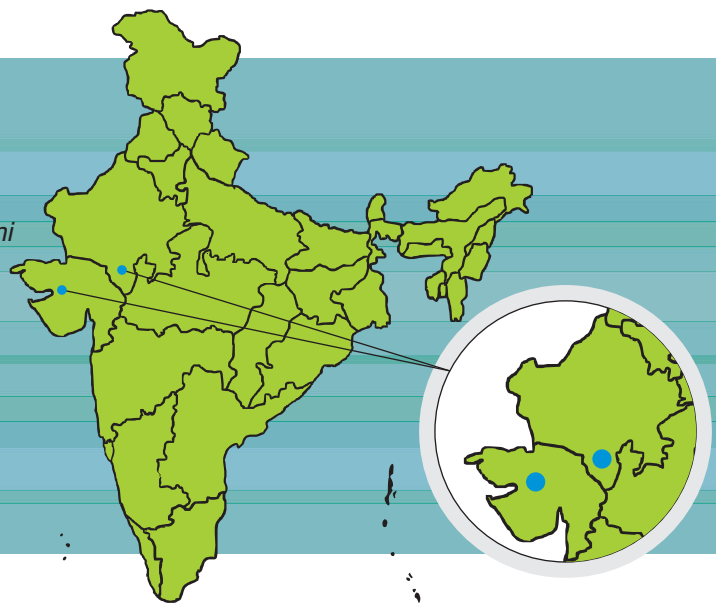
Funding Source
Grant-in-aid

Investigators
Dr. N.P.S. Chauhan and Prof. V.C. Soni

Researchers
Prakash Chandra Mardaraj and Bharat Sharma

Date of initiation
October 2008

Date of completion
June 2012



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 the social organisation (group size, structure, age and 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 its biological characteristics (vegetation cover, composition and biotic pressure) and functional status (use and intensity) with reference to the sloth bear population.

(v) Assess the ranging and activity patterns and movements 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.

(vii) Formulate recommendations for habitat restoration and suggest conservation and management plans for sloth bears in the two sanctuaries.

Progress

Systematic surveys have been completed in Mount Abu and Jessore wildlife sanctuaries and in the corridor area between these sanctuaries. The study area has been stratified into different habitat types on the basis of topography and vegetation using Landsat data. The study area comprised nine broad habitat types, viz. moist deciduous forest, dry deciduous forest, semi-ever green forest, bamboo forest, scrub forest, grassland, rocky outcrops, water bodies and agriculture. Data from indirect evidence showed varying use of these habitats and land use categories by sloth bears.

In all, 49 den sites were identified in 23 places across the sanctuary, located in different types of habitat. Out of 49 dens, 33% (n = 13) were in moist deciduous forest, 21% (n = 8) in dry deciduous forest, 18% (n = 7) in scrub forest, 15% (n = 6) in rocky outcrops, 8% (n = 3) in semi-evergreen forest

and 5% (n = 2) in grasslands. Information on the group size, structure, age and intra-specific behaviour is being collected from Mount Abu Wildlife Sanctuary. Single bears, groups of two bears and mothers with cub(s) were sighted in different areas. In total, 46 direct sightings of sloth bears in different locations were recorded, including 78 bears (adults, sub-adults and young ones).

To estimate the abundance of bears, data collected by walking on 32 linear transects in all the representative areas, covering various habitat types and land use categories, are being compiled. Transects were walked four times over a period of 1 year in different seasons, and observations were recorded in pre-designed formats. While walking on the transects, direct bear sightings were recorded, and indirect evidence of bear presence such as scats and digging of termite mounds or ant nests was noted in 10 m circular plots at 250 m intervals. The data on the indirect evidence recorded during winter, summer and the monsoon are being compiled. Outside the transects, indirect evidence of bears was recorded in 368 instances when carrying out intensive surveys. Most of the evidence was found in dry deciduous forest (31.4%), followed by grassland, bamboo forest and moist deciduous forest.

All necessary preparations have been completed for capturing sloth bears and radio-collaring them. The data collected by walking on transects are also being compiled to assess the habitat connectivity between the two sanctuaries.

Output and Outcomes

Systematic surveys have been completed in Mount Abu and Jessore wildlife sanctuaries and in the corridor area between these sanctuaries. The data from indirect evidence showed varying use of the available habitats and land use categories by sloth bears.

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Ecology of Lions with Emphasis on the Agro-Pastoral Landscapes of the Greater Gir Ecosystem

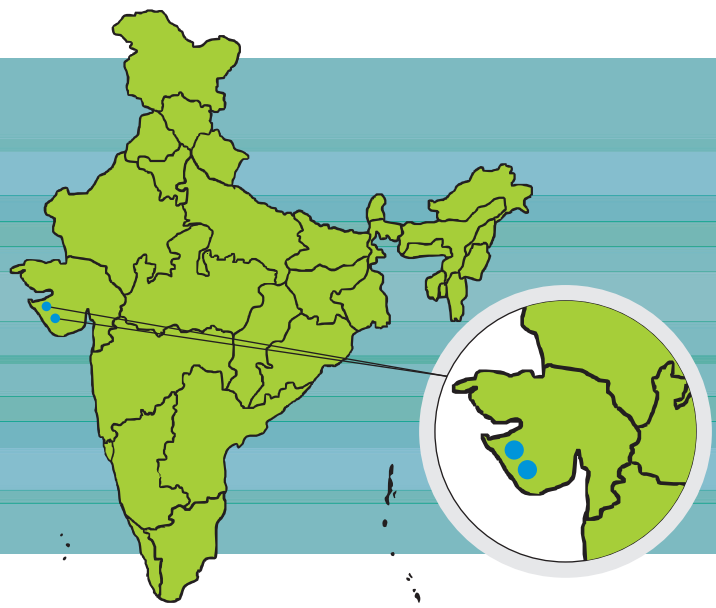
Funding Source
Grant-in-aid

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

The Asiatic lion is an icon of successful conservation. Its numbers and range have increased from fewer than 50 individuals occupying a few hundred square kilometres to over 400 in more than 9,000 km^2. This research aims to investigate the meta-population dynamics of lions in the Greater Gir Landscape, with emphasis on lion demography, ranging, food habits and lion-human conflicts.

Progress

The abundance of lions was estimated in a closed population mark-recapture framework. We monitored 75 individual lions using radio-telemetry (n = 20) and whisker profiles (n = 55 adults, 91 cubs from 38 litters) to deduce demographic parameters and ranging and movement patterns. Lion food habits were studied through predation events (n = 289), scats (n = 475) and continuous monitoring (5,880 hours; 23 sessions, range 8-15 days).

Outputs and Outcomes

Lions increased in numbers with a realized rate of increase r = 0.022 (0.001 SE, P < 0.01, R^2 = 0.98) in the past 42 years. The adult (>2 years) lion density [lions/100 km^2, SE] was estimated to be 12 (1.9) in Gir (west), 8 (3) in Gir (central), 15 (0.1) in Gir (east), 6 (0.7) in Girnar and 2 (0.1) in the eastern landscape, comprising the revenue areas of Junagadh, Amreli and Bhavnagar districts. Population viability analysis (PVA) indicates that habitat connectivity between Gir and Girnar is crucial for the long time (100 year) persistence of the Girnar lions, and we delineated a movement corridor of approximately 1,406 km^2 in which there were revenue and private lands of 90 villages and proposed that it be treated as an 'eco-sensitive zone'.

The average lion group size (including cubs, SE) was 1.98 (0.11) in Gir PA, 3.04 (0.31) in Girnar and 2.85 (0.23) in the eastern landscape. The adult sex ratio (male: female) was 0.63 (0.04 SE), while the ratio of cubs to breeding lionesses was 0.37 (0.1 SE). The inter-birth interval was 1.37 (0.25 SE) years. The average litter size was 2.39 (0.12 SE). The average annual survival rate (SE) of cubs was 0.57 (0.03), that of juveniles was 0.87 (0.04), that of sub-adults was 0.9 (0.04), and that of adult lions (>3 years) was 0.9 (0.01). Human-caused mortality (43%) was significant and is likely to increase in the

future as lion densities increase. The demographic parameters of the high density lion population in Gir are likely regulated by a high cub mortality and emigration into the sink habitat in the larger landscape. The vital rates of the Gir lions did not differ from those of 19 free ranging African lion populations and showed that the genetically depauperate Asiatic lion population did not suffer from depressed demographic parameters. It is possible that the harmful effects of inbreeding on the Asiatic lion might have diminished as deleterious recessive genes were purged from the population by selection.

Many lions outside the Gir PA were long-ranging. Average 95% Fixed Kernel home range (SE) of lionesses was 62 (19) km^2, lions ranged over 189 (36) km^2. Home range of lions within PA was smaller by 82% compared to ranges of lions outside the PA. Many lions moved freely between the PA and the agro-pastoral landscape. Lions in the agro-pastoral landscape were found to be non-selective for any particular habitat at night as they ventured inside human habitations in search of livestock but they do need crucial day time refuges and size of these patches varied from a maximum of 33 km^2 to a minimum of 0.006 km^2.

Domestic livestock contributed 33% of the biomass consumed by lions in the Gir forests. Seventy percent of the lion kills in Girnar was found to be of wild ungulates, while within our study sites in the upper and lower Shetrunjee river basin and revenue areas of Amreli and Bhavnagar districts in the human-dominated eastern landscape, domestic livestock predominated (69%) the lion kills. However, telemetry data on lion feeding events revealed that that despite the use by lions of human-dominated landscapes, their utilization of productive livestock is minimal as the majority of livestock feeding events involved scavenging on livestock carcases (63% in Gir, 50% in Girnar and 72% in the human-dominated eastern landscape), a mechanism permitting the legendary lion-human coexistence in the Gir landscape.

The study, thus, highlights the conflict level, actual and perceived, by differentiating lion predation on productive livestock from scavenging of unproductive surplus cattle of the cattle camps *(Gaushalas and Panjrapoles)* through telemetry. However, in the context of the rapidly changing land-use pattern owing to agrarian intensification and other developmental activities in the landscape, a regional lion conservation plan incorporating a concerted balance between the state's land, development and tourism policies is the need of the hour. Managing the lion density outside Gir at an ecologically viable and socially and economically acceptable level and securing the sub-optimal habitat corridors outside the Gir forest through legislation and eco-restoration and active management of the conflict would be at the crux for the persistence of the lion in the future in the Gir Landscape.

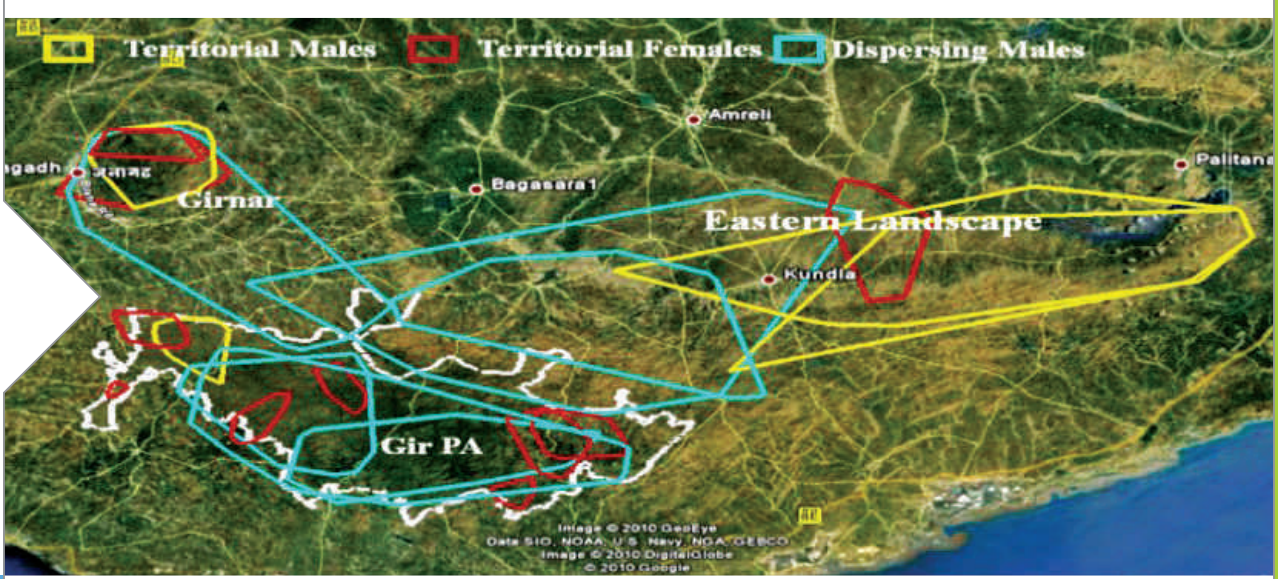


Figure : *100% Minimum Convex Polygon home ranges of radio-collared lions (n=20) on a Google Earth image of the Greater Gir Landscape*

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

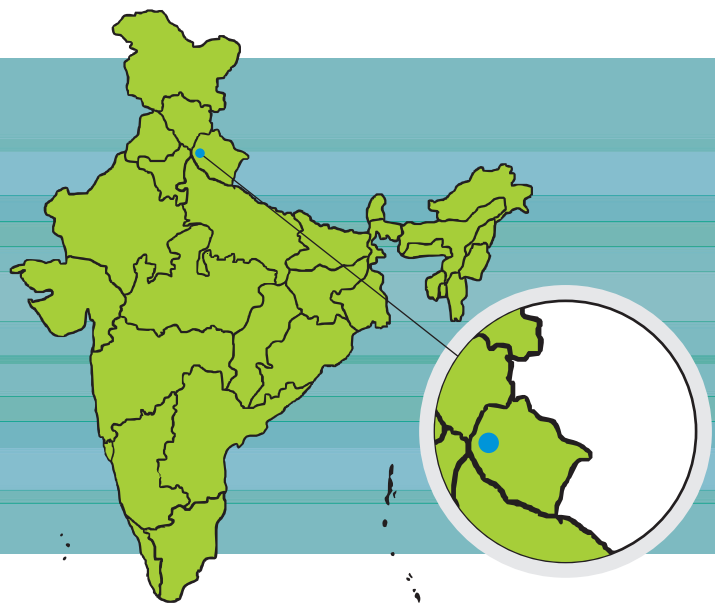
Funding Source
Grant-in-aid

Investigators
Dr. Dhananjai Mohan and Shri Pratap Singh

Researcher
Monika Kaushik

Date of initiation
April 2009

Date of completion
April 2012



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 most protected areas in India, little work has been done to understand the impact of such disturbances 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) To study of influence of biotic disturbances on the avifauna of the western Himalayan foothills tract.

(ii) To identify indicator birds for various disturbance regimes.

(iii) To develop a simple bird habitat monitoring protocol based on the above findings.

Progress

Sampling plots were located and marked across a disturbance gradient in three dominant vegetation types, namely dry sal, in the southern part of Rajaji National Park (RNP), moist sal, in the northern part of RNP and Dehra Dun Forest Division, and *Anogeissus latifolia* tracts in the hilly slopes of RNP to find out the relationship between habitat disturbance and birds. In the winter of 2009-2010 and summer of 2010, a total of 19 plots were used for collecting data on vegetation and the attributes of bird communities. However, data analysis revealed that the number of plots should be increased to cover the variation among different plots. Therefore, in the winter of of 2010-2011, a total of 12 new plots were laid for each vegetation type.

Output and Outcomes

The species accumulation curve for all three forest strata showed that the sampling effort was sufficient as the number of sampling plots versus the number of bird species was asymptotical. All disturbance variables were summarised using principal component analysis (PCA), and a disturbance gradient was established for all three forest strata. PCA was also used to find out the major disturbance factors in all three vegetation types. The PCA results

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showed that grazing pressure is a major disturbance factor in all three forest strata. In mixed hill forest strata, regression between habitat variable and PC1 showed a linear relationship. Additionally, average basal area, canopy cover and average GBH decreased linearly with increasing disturbance level. However, tree density increased with increasing disturbance level. The response of vegetation structure to disturbance gradient in dry and moist deciduous sal forest seems to support the intermediate disturbance hypothesis. The segregation of sites using PCA and cluster analysis corresponds closely with that made a *priori* by investigators. Regression between bird richness, diversity and PC1 did not show any significant relationship in any of the three strata owing to an influx of migratory species and a lack of territorial behaviour. Analysis using DISTANCE shows that the density of birds is the highest in the dry sal forest (DS = 37.15 ± 9.63, MS = 28.14 ± 8.00, MH = 27.07 ± 12.27).

Externally Funded Research Projects

Completed Project
Barcoding Anurans of India

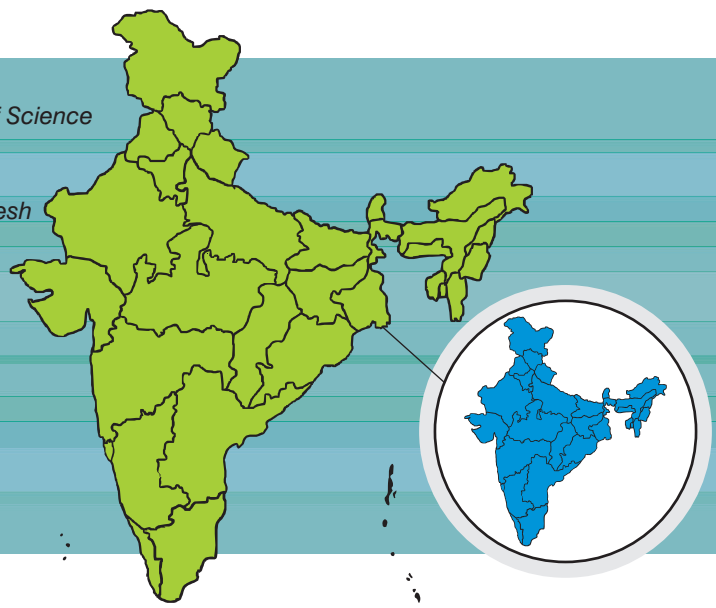
Funding source
Department of Biotechnology, Ministry of Science and Technology, Government of India

Investigators
Dr. Karthikeyan Vasudevan, WII; Dr. Ramesh K. Aggarwal, Centre for Cellular and Molecular Biology (CCMB), Hyderabad and Dr. Sushil K. Dutta, North Orissa University (NOU)

Researcher
Prudhviraj G.

Date of initiation
April 2007

Date of completion
June 2010



Objectives

(i) To document anuran diversity in 'hotspots' and in biogeographically important areas in India (WII, NOU).

(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 above information resource on frog taxa of India with retrievable DNA based/other descriptors.

Progress

Extensive field trips were made in the Eastern Ghats, western Himalaya, North-east and Rajasthan to document the anuran diversity. More than 350 samples were collected from about 80 different localities for barcoding work. Along with samples, field data were collected for multiple morphological and abiotic variables, in addition to photographing the species and collecting different life stages of the species. Larvae at different stages of growth in 21 anuran species were collected from the field or from rearing experiments. At CCMB, wet lab conditions were standardized for DNA isolation, PCR amplification and sequencing. In total >90 primer pairs were designed, targeting a number of informative domains, and these were tested using a panel of 24 frog species representing the known anuran diversity of India. The data obtained in the validation studies strongly suggested that the mtDNA regions (viz., Co-I, Co-II, Co-II, ND-1, etc.) conventionally projected to be suitable for anuran barcodes were highly variable, making it difficult to design specific primer pair(s) that will work universally on a number of species. The extensive work done to this end has helped short-list about 30 primers that were found to be useful to varying extents for the purpose of barcoding; significantly, the exercise revealed that in any case one needs to test more than one primer pair combination to obtain acceptable success with amplification. In addition to the above, description of some novel taxa is also underway.

Outputs and Outcomes

Barcoding is DNA fingerprinting that specifically aims to characterize species using short sequences of DNA as robust and reproducible signatures. This technology is touted as speeding up the rate of discovery of species discovery and reducing the burden on taxonomists. In an attempt to develop barcodes for the anurans (frogs) of India, 368 specimens from about 30 species were accessed. Anurans were collected from 72 locations and were used for this study. In addition to this, 21 frog larvae were used. Barcodes of different genes (12S, 16S rDNA, ND1, Co1, CoII CoIII, Tyrosinae and Rhodopsin) from the collection were sequenced, with emphasis on designing universal primers for barcoding anurans. Over 90 primer pairs were designed, targeting a number of informative domains. These were tested using a panel of 35 frog species. The investigators achieved a 90-100% recovery of barcodes. At least two to six primers were required to retrieve barcodes for the targetted genes. This was primarily due to nucleotide variation at the priming sites of 12S, 16S and ND1. Minimal intra-/inter-specific variations were seen in 16S, and the variation in 12S was comparable. All other domains showed a high level of inter-specific variation. Based on a 0.03 pairwise distance as the cutoff for species demarcation in 16S variation, nine new species were identified. The feasibility of developing universal primers is low, severely constraining barcode recovery. Overall, both the rRNA genes (12s and 16s) provide stable and informative variability, which enables species boundaries to be demarcated. Conversely, all protein coding genes *i.e.*, ND1, Co-1, Co-II, Co-III and Cyt-b, showed inconsistent variability and were, therefore, unsuitable for barcoding. A 'universal DNA barcode' for the frogs from this region still eludes us. However, this study emphasizes the need for multiple sets of primers to generate reasonably informative DNA barcodes even from the closely related taxa, and many cryptic species were revealed.

Significant Findings

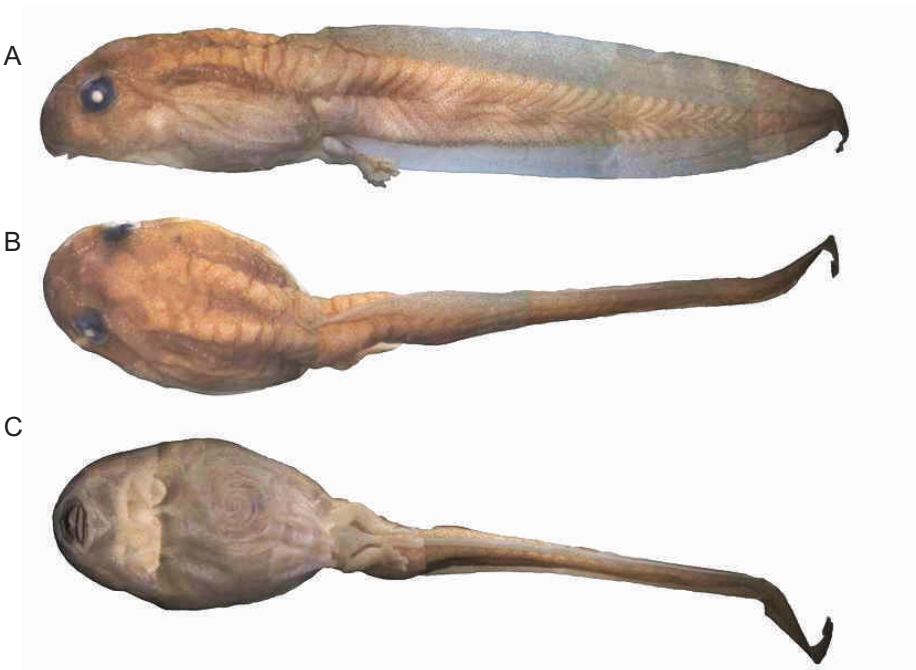
The findings, which provide new perspectives on the subject matter of the research, are the following:

(i) The study achieved 90-100% recovery of barcodes. At least two to six primers were required to retrieve barcodes for the targeted genes. This was primarily due to nucleotide variation at the priming sites of 12S, 16S and ND1.

(ii) Overall, both the rRNA genes (12s and 16s) provide stable and informative variability that enables species boundaries to be demarcated. Conversely, all protein coding genes *i.e.*, ND1, Co-I, Co-II, Co-III and Cyt-b, showed inconsistent variability and were, therefore, unsuitable for barcoding.

(iii) This study emphasizes the need for multiple sets of primers for generating reasonably informative DNA barcodes even from closely related taxa, and many cryptic species were revealed.

Tadpole of venated gliding frog (Rhacophorus pseudomalabaricus) from the Western Ghats. A. lateral View, B. Dorsal view, C. Ventral view scale:10 mm.



Current Status and Availability of High Value Medicinal Plants in Alpine Zones of Dhauladhar Wildlife Sanctuary (DWLS), Western Himalaya

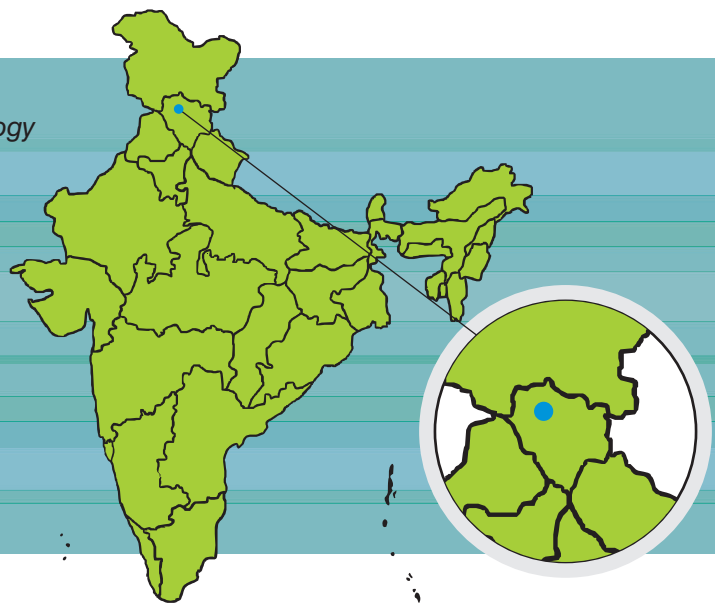
Funding Source
Department of Science and Technology (Govt. of India), New Delhi (Funded under the Women Scientist Scheme)

Investigator
Dr. Anjali Uniyal

Scientist Mentor
Dr. G.S. Rawat

Date of Initiation
March 2008

Date of Completion
March 2011



Objectives

(i) Assessment of distribution patterns of medicinal plants in alpine zones of DWLS.

(ii) Quantitative assessment of medicinal plants in terms of density and frequency.

(iii) Assessment of biomass availability of the medicinal plants.

(iv) Assessment of pressures on the medicinal plants.

Progress

During the current year, surveys were conducted in Dayansar Jot and adjacent areas of DWLS (32° 01' 42" to 32° 27' 27" N and 76° 41' 41" to 77° 01' 42" E). These surveys aimed at assessing the status and distribution of threatened medicinal plants and documenting the pressures on them. Stratified random sampling was done at 40 locations (280 quadrats of 1 × 1 m^2. The fresh weight of the material harvested by local herb collectors was recorded in the field using a digital balance, and later, the samples were oven dried (50°C) till a constant weight was achieved in the laboratory. Biomass values were analysed for the moisture content. The pressures on the target medicinal plants were assessed by assigning disturbance scores to each habitat. Indicators of disturbance such as signs of grazing, number of livestock herds, presence of livestock dung and camping sites of graziers were recorded. Camping sites of medicinal plant collectors were also recorded, and data on their numbers and the quantity collected per day were also recorded.

Outputs and Outcomes

Of the 12 already identified threatened medicinal plants with a high market demand in Dayansar Jot, only six species were encountered in the sample plots. The highest species diversity (H' = 1.09) was observed in the Lamba Got area, and the lowest (H' = 0.49) was observed in the Dayansar area. The former is less disturbed compared with the latter, where graziers camp. In general, the species diversity at Dayansar was low compared with the Uhl and Lambadag valleys, which were surveyed in 2008 and 2009, respectively. Areas below 3200 m in altitude are heavily grazed by the *Gujjar* livestock, whereas areas above 3200 m (all the areas adjacent

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to Kullu pass and around Dayansar lake) are grazed by the sheep and goats of *Gaddis* and are also under high extraction pressures. In addition, an annual fair of the local deity leads to an influx of visitors during the peak growing and flowering season. This must be influencing the abundance and diversity of species there. Compared with Uhl and Lambadug valleys, *Taxus wallichiana* was present here in the sub-alpine zones, while D. *hatagirea* and P. *hexandrum* were not encountered in the plots. *Rheum austral*, followed by *Aconitum heterophyllum*, is the most widespread species in Dayansar. *Picrorhiza Kurrooa*, which is extracted heavily from the area, was restricted to very high and steep slopes around Dayansar-Kullu Pass. Recognizing the ecological and trade value of *P. kurrooa*, and considering the observations of the present study, a rapid vulnerability assessment (RVA) was carried out for *Picrorhiza*. The RVA score turns out to be 30 for *Picrorhiza*, which is on the higher side of the RVA index, indicating a high degree of vulnerability.

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Ecology of Tigers in Ranthambore Tiger Reserve, India

Ongoing Projects

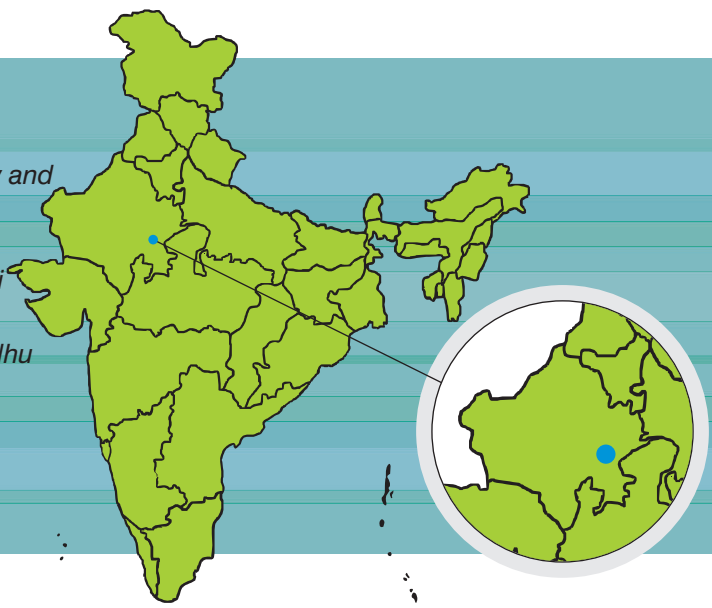
Funding Source
Rajasthan Forest Department, National Tiger Conservation Authority and Wildlife Institute of India

Investigators
Dr. Y.V. Jhala and Shri Qamar Qureshi

Researcher
J. Peter Prem Chakravarthi, Ayan Sadhu

Date of Initiation
April 2007

Date of Completion
April 2013



Objectives

The objectives of the project are to :

(i) Study the ecology of Bengal tigers *(Panthera tigris)* using radio-telemetry (VHF, GPS and satellite collars) in a semi-arid landscape

(ii) Monitor the tiger population and its trend, as well as the prey population

(iii) Evaluate the survivorship of Bengal tigers.

Progress

Eight tigers have been radio-collared (with three GPS collars, three VHF collars and two wildlife material activity collars) and their home ranges and habitat use were analysed through radio-telemetry data. During 2010-2011, the core habitat of T17 (radio-collared tigress) was identified (Fig. 1) from radio-telemetry data collected during 2010-2011. Its home range was 15.57 km^2 (using 95% MCP).

The abundance and density of tigers were derived using the camera trap data of 2010. In 2010, the abundance of tigers was 31 (± 1). The prey species of tigers and co-predators were estimated by distance sampling, and the data were analysed

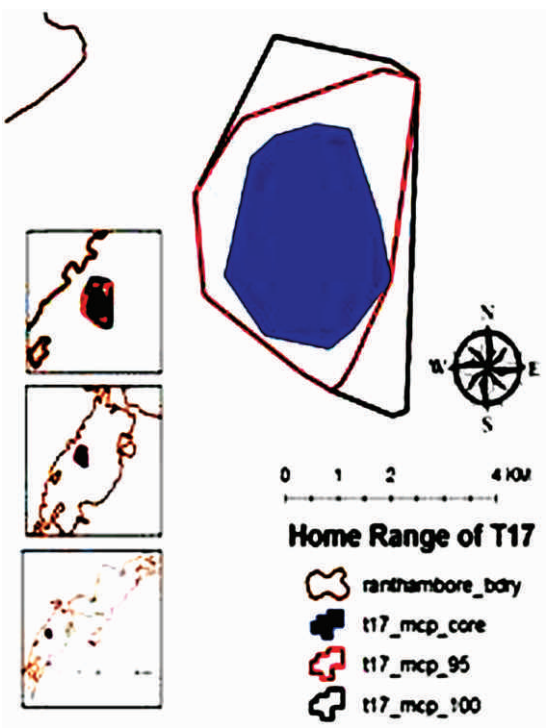


Figure 1 : Home range of a female tiger in RTR.

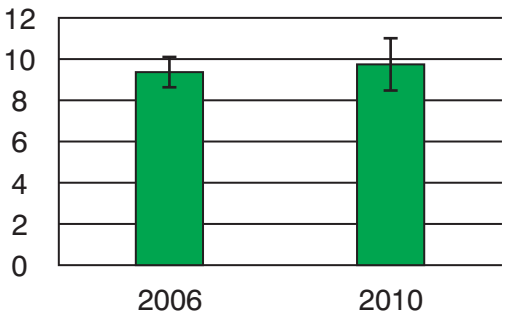


Figure 2 : Density of tiger/100 sq km in RTR.

using DISTANCE. In 2010-2011 the density of wild prey species per 100 km2 was 16.13 (sambar), 58.6 (chital), 8.23 (nilgai) and 92.78 (all ungulate prey species).

The survival rate of the Ranthambore tigers was high: 0.96 (± 0.007) for cubs, 0.95 (±0.006) for sub-adults and 0.98 (± 0.34) for adult tigers. Cub survival was estimated after the age of 3 months and did not include early mortality.

Macro-ecology of Terrestrial Herpetofauna of Andaman and Nicobar Archipelago

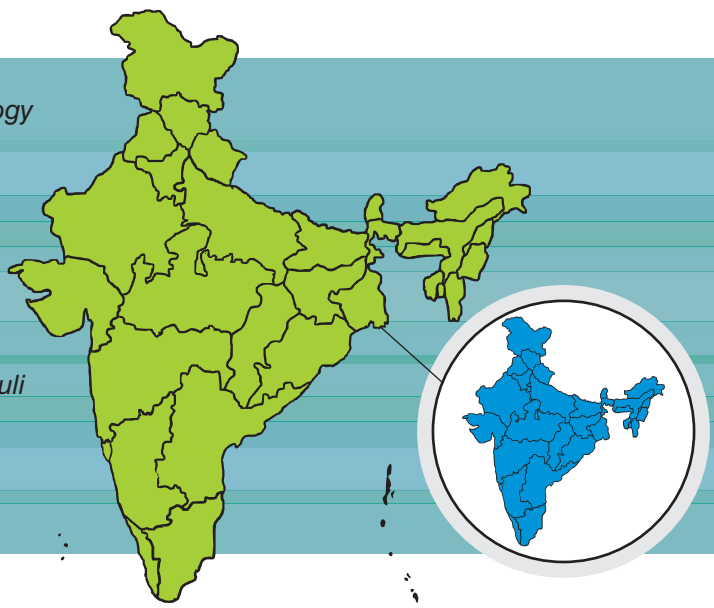
Funding source
Department of Science and Technology

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

Researchers
S. Harikrishnan and S.R. Chandramouli

Date of initiation
November 2009

Date of completion
November 2013



Objectives

The objectives of the project were to :

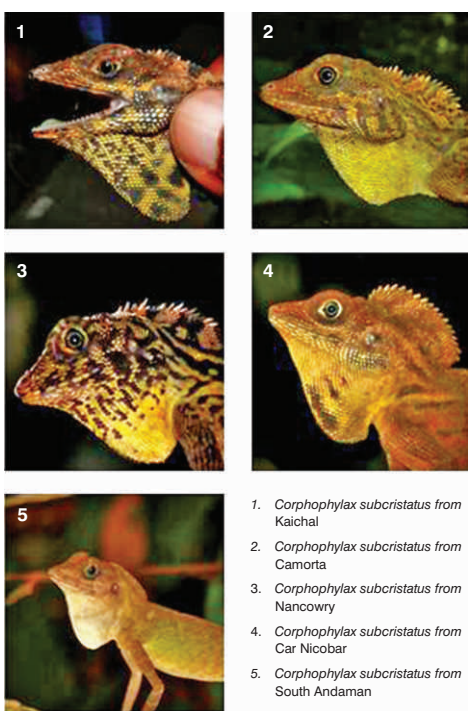
(i) Identify the factors which influence the spatial patterns in species abundance and distribution of reptiles and amphibians in islands.

(ii) Test null models in the community structure of insular reptiles and amphibians.

(iii) Identify the factors which influence the community structure of reptiles and amphibians in islands.

Progress

During the reporting period, three sites, *i.e.* North Wandoor, Chidiyatapu and Mt. Harriet National Park of South Andaman Island, were sampled. A number of different sampling methods were used to sample reptiles and amphibians as no single method is likely to sample all different taxa. These included visual encounter surveys (VES), pitfall traps with drift fences, and quadrat sampling. Initially, forest floor and under-storey herpetofauna were sampled. Subsequently, 100 m transects were sampled through distance sampling. At the same time, 10 m ×



1. *Corphophylax subcristatus from* Kaichal
2. *Corphophylax subcristatus from* Camorta
3. *Corphophylax subcristatus from* Nancowry
4. *Corphophylax subcristatus from* Car Nicobar
5. *Corphophylax subcristatus from* South Andaman

The variation in colouration of the endemic lizard Corphophylax subcristatus as documented in different Islands in the Nicobars.

10 m quadrats were used that were covered completely on the periphery with plastic sheets for counting all the animals present in the quadrat. Counts were used from these plots to evaluate the efficiency of the 5 m × 5 m open quadrats and the distance sampling. Both methods were found to severely underestimate the true number of individuals present in an area. Subsequently, a double sampling approach was used. This approach seems to be the best for sampling forest floor and understorey herpetofauna. At a given site, a 10 m × 10 m bound quadrat was sampled intensively to detect all the reptiles and amphibians present. Larger quadrats were used primarily to reduce the number of quadrats with no detections to reduce the variance. For each such bound quadrat, an unbound quadrat of the same dimensions was surveyed nearby. In this way each intensive survey plot was paired with a rapid survey plot. On the basis of this method, a ratio estimator was arrived at for the mean number of animals present. This estimate multiplied with the notional number of quadrats in a 1 ha area was used to calculate the number of individuals per hectare.

Outputs and Outcomes

The overall species richness (including data from field sampling and earlier records) for South Andaman Island was 19 species of lizard, 16 species of snake and 12 species of frog. VES, distance sampling, pitfall trapping, quadrats and opportunistic records together recorded 18 species of lizard, 13 species of snake and 10 species of frog from South Andaman Island. The highest numbers of species were recorded from Wandoor, while the lowest numbers were from Chidiyatapu. The forests in Chidiyatapu regenerated after forestry operations, and VES suggested very low density and richness of herpetofauna. Intensive sampling was done only in Wandoor and Mt. Harriet, where primary evergreen forests were available. About 75 man-hours were spent in time constrained VES surveys, during which 744 reptiles and amphibians belonging to 19 different species were recorded. This included seven species of lizard, including two new species, six species of snake and six species of frog, including two new species.

Ten species of lizard and four species of snake were recorded in quadrats, with open and bound quadrats recording eight and ten species each, respectively. Open and bound quadrats recorded three and one species of snake, and six and nine species of frog, respectively. Bound quadrats had higher species richness and density per sample compared with open quadrats. Based on the four bound quadrats that were sampled during the wet post-monsoon period, the frog density was estimated at 3025/ha (121 individuals from four 10 m × 10 m quadrats). This is assumed to be a total count in the sampled plot as the area was fenced off to prevent animals escaping. These preliminary results indicate that the frog density in South Andaman Island during the wet season is one of the highest in the world. More sampling during the wet season is necessary to estimate the true density of frogs in the Andaman Islands.

For lizards, density estimation was done through the double sampling approach. Open quadrats recorded an average of 7.84 lizards/quadrat, while bound quadrats recorded 14.5 lizards/quadrat. The estimated average number of lizards per quadrat was 15.69 (SD = 1.29), and the density was 1569 (± 305) lizards/ha. This amounts to an average lizard biomass of 16.58 kg/ha (calculation based on only species that were recorded in the quadrats).

In the absence of native large mammals, other than the Andaman wild pig *(Sus scrofa andamanensis)* and the masked palm civet *(Paguma larvata tytleri)*, the contribution of herpetofauna to the total above ground biomass is significant and points to the importance of these animals in the forests of the Andaman and Nicobar Islands. The densities reported here are among the highest recorded in Asia. Nevertheless, several species are rare and were recorded only once or not recorded at all. These include the rare *Lipinia macrotympana, Typhlops andamananensis* and *Gonyosoma oxycephalum*, which were not found in any of the areas sampled. An unidentified species of *Pseudocalotes* was also recorded.

Milestone

An important outcome of this effort was the formulation of a sampling strategy that allowed the inclusion of the detection probability in estimating the density. Prior to this study, the majority of studies that estimated the density of herpetofauna used count data or used uncalibrated indices. Double sampling using quadrats seems to be the most efficient approach for obtaining reliable estimates of densities of herpetofauna in islands.

Studies on Housing and Enclosure Enrichment of Some Species in Selected Indian Zoos

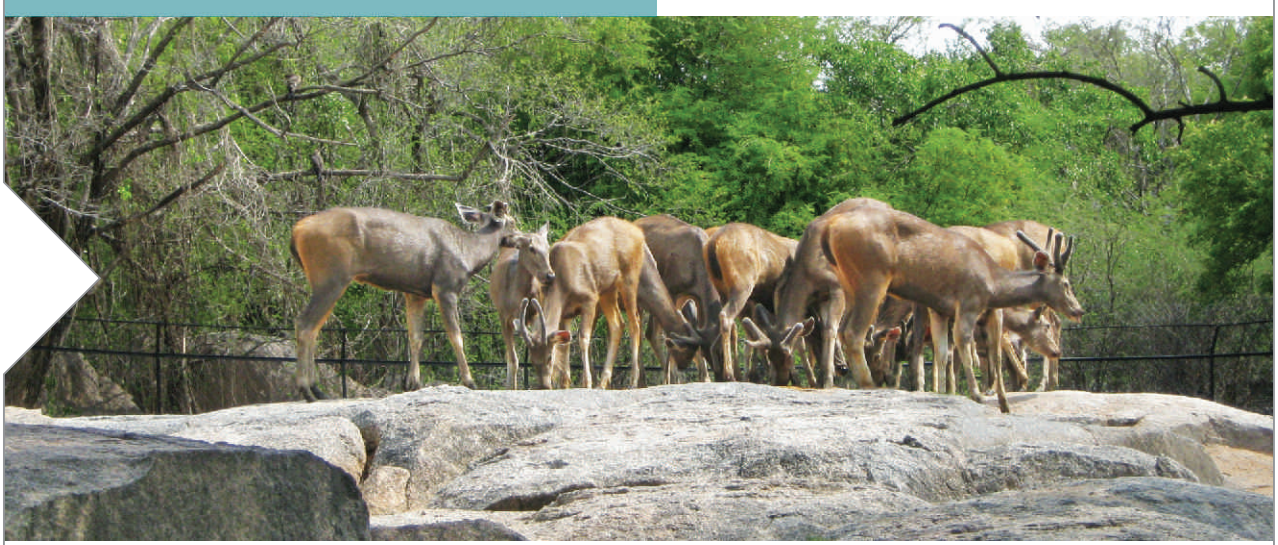
Funding Source
Central Zoo Authority

Investigators
Shri P.C. Tyagi and Dr. Parag Nigam

Researchers
Sitendu Goswami and Nilofer Kundu

Date of Initiation
January 2011

Date of Completion
January 2013



Objectives

The project objectives include the following :

(i) Carrying out a literature review of the existing knowledge relevant to captive management of target species.

(ii) Assessment of the existing housing facilities and enclosure enrichment for the target species in Indian zoos.

(iii) Developing a critical note for suitable housing and enclosure enrichment for the target species.

(iv) Developing protocols for enclosure enrichment for the well-being of target captive wild animals.

Progress

The project has been operational since January 2011. A literature review and compilation of the relevant literature and other information available from various sources, viz. information available from peer reviewed journals, research reports and enrichment practices of zoos outside India available from various sources, has been initiated. The review of the literature focuses on the biology and habitat requirements of free ranging con-specifics and information on captive management, use of enrichment devices for the target species, abnormal behaviour and its amelioration.

Outputs and Outcomes

Information on the different species with respect to zoos and the number of animals in captivity, and literature from various sources in the form of peer reviewed publications, dissertations and research reports, has been compiled.

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

Funding Source
Central Zoo Authority

Investigators
Dr. Parag Nigam and Shri P.C. Tyagi

Researchers
Anupam Srivastav and Manjari Malviya

Date of Initiation
November 2006

Date of Completion
November 2011

Objectives

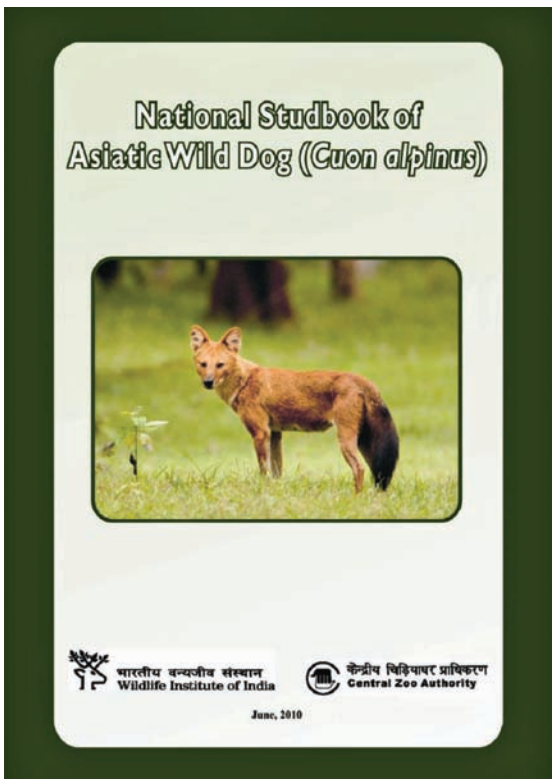
The project objectives are to compile, update and maintain studbooks of 14 endangered species, viz. the Asiatic lion, Bengal tiger, Indian rhinoceros, lion tailed macaque, Tibetan wolf, gaur (Indian bison), Nilgiri langur, red/lesser panda, snow leopard, Bhutan grey peacock pheasant, wild dog (dhole),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

Progress

Data on the pedigrees of four species, namely the gaur (Indian bison), Indian wild ass, dhole (wild dog) and grey peacock pheasant, were collected from the holding zoos. The data were entered in SPARKS 1.5 and analysed using PM 2000. The studbooks of the above four species were compiled.

Outputs and Outcomes

The studbooks included descriptions of the basic biology and behaviour of the species, complete listings of the individuals living in captivity and historical listings. The studbooks of the gaur (Indian bison) and Indian wild ass included detailed demographic and genetic analyses. Population management plans and breeding recommendation were provided as a part of the studbooks. The studbooks of the dhole (wild dog) and grey peacock pheasant included a few individuals of known age and a large number of individuals of unknown ancestry, limiting demographic and genetic analysis of the captive populations.



Study of Bird Species Numbers and Densities in East and West Himalaya

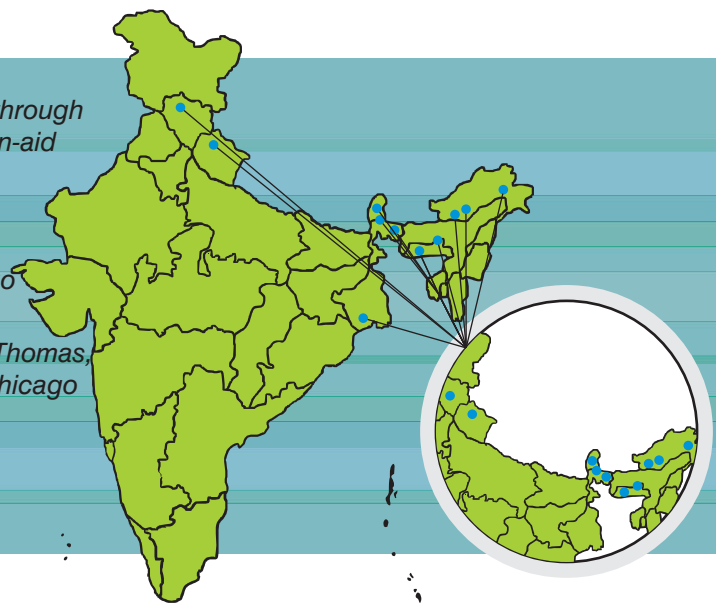
Funding Source
National Science Foundation (USA) through University of Chicago and WII grant-in-aid

Investigators
Dr. Dhananjai Mohan and Shri Pratap Singh, WII and Dr. Trevor Price, University of Chicago

Researchers
Mousumi Ghosh, WII and Dr. Dieter Thomas, Post-Doctoral Fellow, University of Chicago

Date of Initiation
January 2007

Date of Completion
January 2012



Objectives

The objective of the study is to understand species distributions, 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 carried out at Pakke Tiger Reserve, Eagle nest Wildlife Sanctuary and Dirang Forest, Arunachal Pradesh and at Banjar-Jalori Reserve Forest, Himachal Pradesh. The fieldwork included ascertaining the altitudinal distribution of birds in the eastern Himalaya, capturing birds for collection of tail-feather bases for DNA sequencing, quantification of insect abundance and studying the vocalizations of select species.

Outputs and Outcomes

The eastern Himalaya is probably biologically the second richest place in the world on a 100 × 100 km^2 scale, after the northern Andes. Preliminary comparisons of DNA sequences suggest that the genetic diversity (age of species) is higher than in the Andes. Unlike the Andes, there has been very little speciation in the last two million years, and even closely related bird species can be separated by up to four million years. About twice as many bird species are found in a 100 × 100 km^2 area in the eastern Himalaya as compared with the west. This is largely a result of many forest species found between 1000 m and 2000 m altitude in the east not being present in the west. This is associated with the west being drier and having generally sparser vegetation (lower density of trees with less foliage). About one-fourth of all species are present in both the east and the west. These tend to be species at high elevations in the east, which experience a climate similar to the climate found at lower elevations in the west. In both the east and west, the intermediate elevations (1000-2500 m) are the most species rich. These are probably the most endangered areas in the west; differed significantly across elevational zones in eastern and western sites. The arthropod abundance was highest in the broadleaved forests at 1260 m in the eastern Himalaya and in the mixed-conifer forests at 2550 m in the western Himalaya; and the overall arthropod abundance was higher at the eastern sites.

Milestone

The paper 'Determinants of northerly range limits along the Himalayan bird diversity gradient' by Trevor D. Price, Dhananjai Mohan, D. Thomas Tietze, Daniel M. Hooper, C. David L. Orme and Pamela C. Rasmussen in *American Naturalist* is based on the findings of the ongoing research work under the project.

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

Funding Source
Uttarakhand Forest Department (UKFD)

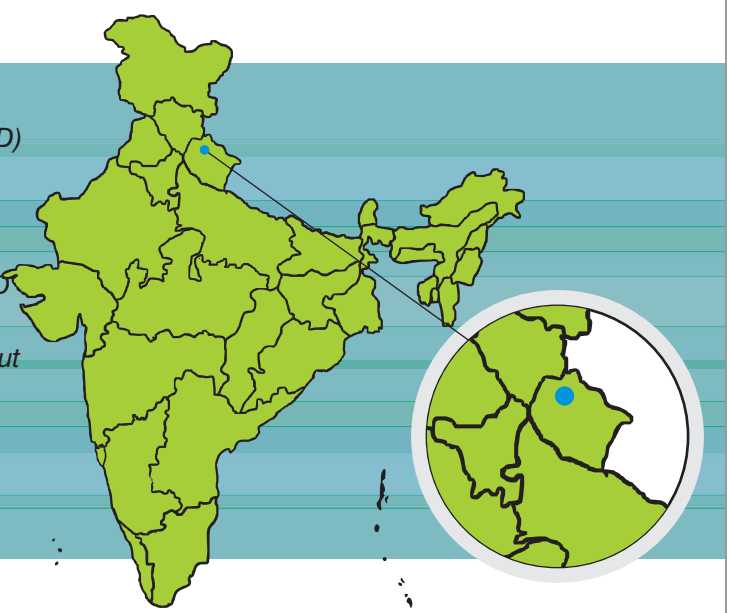
Investigators
Dr. G.S. Rawat and Dr. B.S. Adhikari

Advisor/collaborator
Dr. S. Chandola, PCCF (Wildlife), UKFD

Researchers
Umesh Kumar Tiwari and Ninad V. Raut

Date of initiation
January 2008

Date of completion
July 2011



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.

(iii) Evolve strategies for harvesting medicinal and aromatic plants sustainably.

Progress

During the reporting period, surveys were conducted in seven forest divisions (FDs) of Garhwal, viz., Rudra Prayag, Tehri, Pauri, Chakrata, Haridwar, Lansdowne and Kalsi. Data entry for 12 FDs (of the total 15 FDs surveyed) has been completed. In all, 613 transects were laid for the quantification of MAPs in different FDs. The beginning and end points of all the transects have been geo-referenced, and other data such as the mean elevation range and characteristic features such as the vegetation type and anthropogenic pressures have been recorded. Interim reports for three FDs, viz., Dehra Dun, Mussoorie and Upper Yamuna, have been submitted to the Uttarakhand Forest Department for incorporation in the forestry working plans. In Mussoorie FD, two sites, one each in the Jaunpur and Kempty ranges, have been recommended for establishment of a medicinal plant development area (MPDA).

Outputs and Outcomes

The study revealed that in the surveyed areas in general, *Rubia cordifolia* and *Hedychium spicatum* are commonly found, whereas the populations of *Valeriana jatamansii* and *Bergenia ciliata* are small. Immediate conservation measures need to be undertaken for *Swertia chirayita* and *Gentiana kurroo*. It is recommended that the medicinal plants restricted to alpine meadows, *viz*. *Dactylorhiza hatagirea, Gymnadenia orchidis, Nardostachys jatamansi, Picrorhiza kurrooa, Aconitum hetrophyllum, Aconitum balfouri, Paris polyphylla, Arnebia benthamii, Meconopsis aculeata, Rheum moorcroftianum* and *Rheum webbianum*, be conserved *in situ*.

Milestone

The results of projects were presented in Vth Uttarakhand State Science Congress during November 10-12, 2010. Mr. Ninad V. Raut (Senior Research Fellow) won the Young Scientist award for Best Oral Presentation - 2010 in this congress, on the topic, 'Status of traditional knowledge on use of medicinal plants in Uttarkashi District, Uttarakhand'.

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Diversity of Spiders in Nanda Devi Biosphere Reserve, Uttarakhand

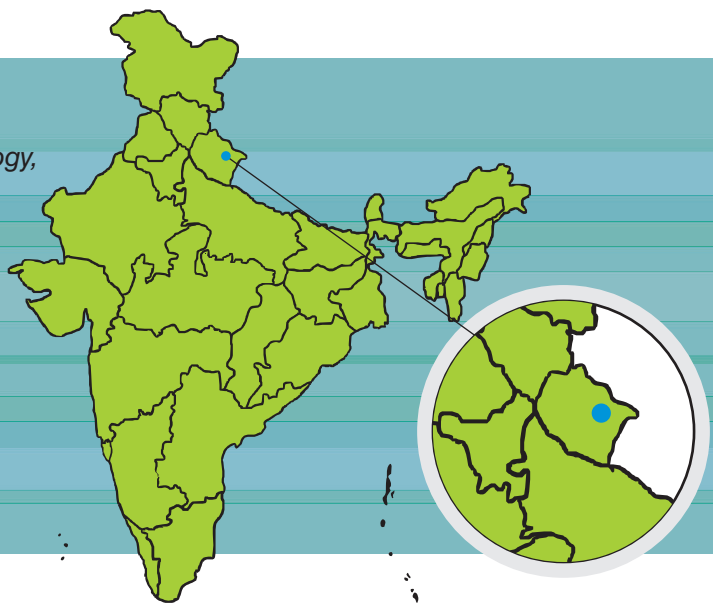
Funding Source
Department of Science and Technology, Government of India

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.

(ii) Assess the diversity and distribution of spiders in different vegetation types along altitudinal gradients.

Progress

Spiders are amongst the highly species rich groups of invertebrates that exploit a wide variety of niches in virtually all the earth's biomes and play vital roles in sustaining ecosystems. Select sites with a substantial altitudinal range were sampled in Nanda Devi Biosphere Reserve (NDBR). The sampling required a combination of methods to collect spiders from all habitats. So six different collection techniques were used, viz. pitfall trapping, vegetation beating, litter sampling, ground hand collection, aerial hand collection and sweep netting. To collect ground dwelling spiders in particular, nine pitfall traps (cylindrical plastic bottles of diameter 9 cm and depth 11 cm) were arranged within the quadrats in three horizontal and three vertical rows, each at a distance of 5 m from the nearest neighbour, thus forming four smaller (5 m × 5 m) grids within the sampling plot. The traps were filled with a liquid preservative (69% water, 30% ethyl acetate and 1% detergent). Other methods were used to collect web builders, ambushers and ground runner spiders. Stratified random sampling was employed to capture spider specimens from these plots. Sampling was carried along the altitude at three sites: (i) Lata Kharak (2000 m-4000 m); (ii) Valley of Flowers (1800 m-4100 m) and (iii) Malari (3000 m-4000 m). In all these sites, 106 square quadrats (10 m × 10 m) were laid randomly along altitudinal gradients. Collected specimens were transferred to 70% alcohol. All adult specimens were identified to the family, genus or species level. Species were distinguished by examination of external genitalia. Identification of both sexes was done on the basis of morphometric characters of various body parts and the genitalia. Spider samples were identified up to the species level. Voucher specimens were deposited at the Wildlife Institute of India, Dehra Dun.

Outputs and Outcomes

A total of 213 species belonging to 90 genera and 31 families were collected during the entire sampling period in NDBR. Some spiders were widely distributed throughout the sampling area, while others were restricted to one or a few sampling plots. It was observed during the study period that the families with the highest number of total species were Araneidae, with 39 species (18.3% of all the species), followed by Salticidae (11.3%, 24 species); Thomisidae (10.8%, 23 species), Theridiidae (7%, 15 species), Linyphiidae (6.6%; 14 species) and Lycosidae (5.6%, 12 species). These were followed by Uloboridae and Oxyopidae (4.7%, 10 species, each); Sparassidae (4.2%, nine species); and Tetragnathidae, Gnaphosidae and Clubionidae (3.3%, seven species, each). The other families made up the remaining 16.9% of the species.

Milestone

During this study, a taxonomic database of the Himalayan spider fauna was prepared for the first time. It also emphasizes the need for conservation of spider biodiversity by characterizing the species diversity and highlighting the rare and endemic species of NDBR.

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Regional Rangeland Programme: Phase III in India

Funding Source
International Centre for Integrated Mountain Development (ICIMOD), Kathmandu, Nepal

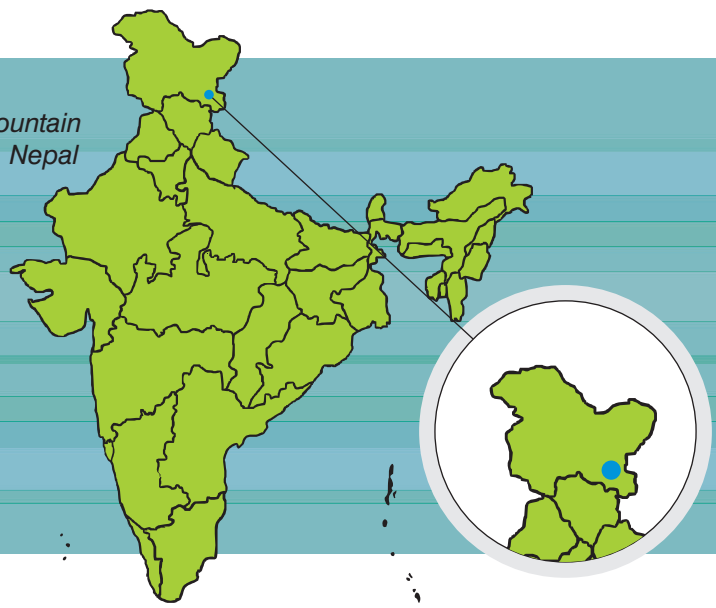
Nodal officer
Dr. G.S. Rawat

Co-Investigator
Dr. B.S. Adhikari

Project Biologist
Amit Kotia

Date of Initiation
June 2010

Date of Completion
June 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

(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 the rangeland co-management committees formed in Chusul, Hanley, Tsomoriri and Samad were consulted to gather knowledge about the issues of pasture development and forage availability. Areas have been identified for fodder development in selected areas on the basis of the initial consultation. The DSH plans to supply seeds of alpha-alpha, rye and other native fodder grasses to the herders. In addition, extensive surveys were conducted in three blocks of eastern Ladakh (Durbuk, Samad and Nyoma) to document the current firewood consumption pattern and to assess the feasibility of supplying alternate sources of energy such as solar cookers, solar heaters and solar lights. Three local entrepreneurs from Ladakh were sent to ICIMOD (Kathmandu) for basic training in various methods of saving energy and for designing energy efficient ovens. ICIMOD has provided additional financial support to a few entrepreneurs for designing and demonstrating fuel efficient ovens.

Outputs and Outcomes

In continuation of earlier efforts to monitor the rangeland vegetation in Changthang plateau, repeat observations were made at Tso Kar basin to assess the changes in the ground vegetation, especially in Caragana and Eurotia patches. Preliminary analysis reveals that the cover of both the woody species has declined in the lower parts of Tso Kar.

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Kailash Sacred Landscape Conservation Initiative (KSLCI)

Funding Source
International Centre for Integrated Mountain Development (ICIMOD), Kathmandu, Nepal

Nodal Officer
Dr. G.S. Rawat

Participants
Dr. B.S. Adhikari, Shri G.S. Bhardwaj, Dr. V.K. Melkani, Dr. S. Sathyakumar and Dr. V.P. Uniyal

Research Associate
Pankaj Sahni

Date of Initiation
August 2010

Date of Completion
August 2011

Objectives

The major objectives of this initiative are :

(I) To mainstream biodiversity conservation, sustainable use of land and natural resources, and cultural heritage protection, into policies, plans and practices at the regional, national and local levels.

(ii) To enhance the Kailash Sacred Landscape (KSL) national and regional knowledge base on priority themes through monitoring and applied research.

(iii) To build the capacity of key institutions and organizations at the regional, national and local levels for long-term environmental monitoring, environmental, ecological and socio-economic research, and conservation interventions.

(iv) To establish a regional knowledge sharing platform to support science-based decision-making for cultural heritage protection, biodiversity conservation, ecosystem management, sustainable use of resources and climate change adaptation.

Progress

During the first year of the project, WII participated in the preparation of a feasibility report for the Indian part of KSL, covering Pithoragarh and Bageshwar (part) districts in the state of Uttarakhand. Detailed surveys of the flora, fauna, forest types, rangelands and patterns of resource use by various ethnic communities were conducted. Based on the primary and secondary information collected during the surveys, a detailed conservation strategy was developed that forms the basis for future biodiversity conservation and management, livelihood improvement, sustainable development and climate change adaptation in the region. This was accompanied by a comprehensive long-term environmental monitoring plan (CEMP). Such plans have been prepared by each member country. Key elements from these plans have been incorporated into the Regional Cooperation Framework (RCF), which describes the mechanisms to be used to promote and facilitate collaboration among the various actors and stakeholders and to enhance regional knowledge and information exchange networks.

Outputs and Outcomes

Strengthening local capacity for conservation, sustainable development, climate change adaptation, maintenance of the cultural and aesthetic integrity of the landscape and enhancing the socio-ecological resilience of mountain communities are important outcomes. These have been described in the KSLCI Project document and the various KSLCI outputs.

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Monitoring of Reintroduced Tigers in Sariska Tiger Reserve, Rajasthan

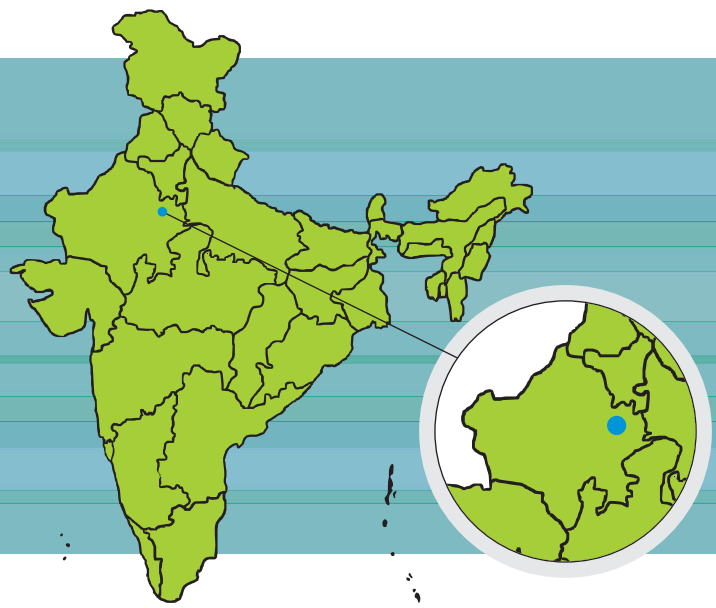
Funding Source
Forest Department, Government of Rajasthan

Investigator
Dr. K. Sankar

Researcher
Subhadeep Bhattacharjee

Date of Initiation
February 2009

Date of Completion
February 2012



Objectives

The objectives of the project are to :

(i) Collect information on the ranging, movement, home ranges and dispersal pattern of the re-introduced tigers.

(ii) Collect information on the use of the habitat by the re-introduced tigers.

(iii) Gather information on the food habits of the re-introduced tigers.

(iv) Assess the population of the prey species.

(v) Prepare a habitat suitability map for the tiger and its prey species.

vi) Study the effects of anthropogenic pressure on the distribution of the tigers.

(vii) Evaluate the response of the tigers and their prey species with respect to the removal of anthropogenic influence from the relocated villages.

(viii) Suggest management recommendations for effective conservation of tigers in the tiger reserve.

Progress

Three tigers were reintroduced during June-July 2008 (a male (ST1) and a female (ST2)) and February 2009 (a female (ST3)) from Ranthambore TR to Sariska TR. Another two tigers (a male (ST4) and a female (ST5)) were reintroduced from Ranthambore in July 2010. The first reintroduced tiger, ST1, died on November 14, 2010 at Rajore near a village, Kalakhet, in Sariska. Thereafter, an adult male tiger, which had strayed out from Ranthambore and had settled in Keoladeo National Park, Bharatpur was translocated to Sariska in February 2011. All the six re-introduced tigers (three males (one died) and three females) were monitored periodically through ground tracking using the 'homing in' and 'triangulation' techniques during the reporting period. The minimum convex polygon (MCP) technique was used for home range calculation. The prey species abundance in the study area was estimated using the line transect method and the distance sampling technique. In total, 20 line transects varying in length from 1.6 km to 2 km were laid, covering an area of 160 km^2. Three replicates were walked on these transects in summer and in the monsoon. In winter, five

replicates were walked on all these transects. DISTANCE 5.0 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 every 200 m (sampling points). Tiger scats were collected systematically by sampling the forest trails and trekking paths and opportunistically from all over Sariska. In total, 158 tiger scats were collected during the reporting period to study the food habits. The micro-histological structures of hairs were used to identify the prey species. In total, 144 tiger kills were recorded.

Outputs and Outcomes

The monthly areas of utilization of tigers ST2 to ST6 were estimated as 40, 85, 140, 70 and 205 km^2, respectively. The annual home ranges of the tigers were calculated as 152.4, 45.9 and 95.9 km^2, respectively, for ST1, ST2 and ST3. The MCPs of the areas utilized by ST4, ST5 and ST6 till March 31, 2011 were estimated as 204.7, 184.9 and 208.2 km^2, respectively. It was found that all the three tigers had settled in the best available habitats in Sariska. The individual prey densities and mean group sizes were estimated for all prey species. The density of peafowl was the highest amongst all the prey species (60.4 ± 5.6 km^{-2}), followed by livestock (buffalo and brahminy cattle), sambar, nilgai, chital, common langur and wild pig. The estimated encounter rate of peafowl was also highest (9.40 km^{-1}), followed by livestock, sambar, nilgai, common langur, chital and wild pig. Scat analysis revealed that the sambar was the most utilized prey (38.50%) in the diet of the tiger followed by livestock, chital, nilgai and wild pig. Remains of common langur, porcupine and peafowl occurred <1.0% in tiger scats. The prey preference of tigers was in the following order: sambar > chital > nilgai > wild pig> common langur > livestock. Livestock was found most frequently in tiger kills (39.6%), followed by sambar, nilgai and chital. Occasionally wild pig, porcupine and peafowl were also predated by tigers.

Significant Findings

So far we have successfully re-introduced six tigers in Sariska. Tigers were transported by helicopter and also by road. Initially the tigers were kept in a 1 ha enclosure, and after 2 to 8 days of monitoring, they were released in the wild using a soft release technique as per the IUCN protocol. All the individuals initially explored large areas up to 220 km^2 in extent. The large home range sizes were attributed to their initial habitat exploration after reintroduction. Gradually it was found that all the tigers settled in the best available habitats in Sariska. None of the tigers showed a 'homing instinct'. No overlap was observed between the home ranges of male tigers, and a very small (<10%) home range overlap was observed between the female tigers. The reintroduced tigers adapted to the new environment in Sariska and started killing wild prey soon after the reintroduction.

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Conservation of the Endangered Asiatic Wild Dog *Cuon Alpinus* in Western Arunachal Pradesh: Linking Ecology, Ethnics and Economics to Foster Better Co-existence

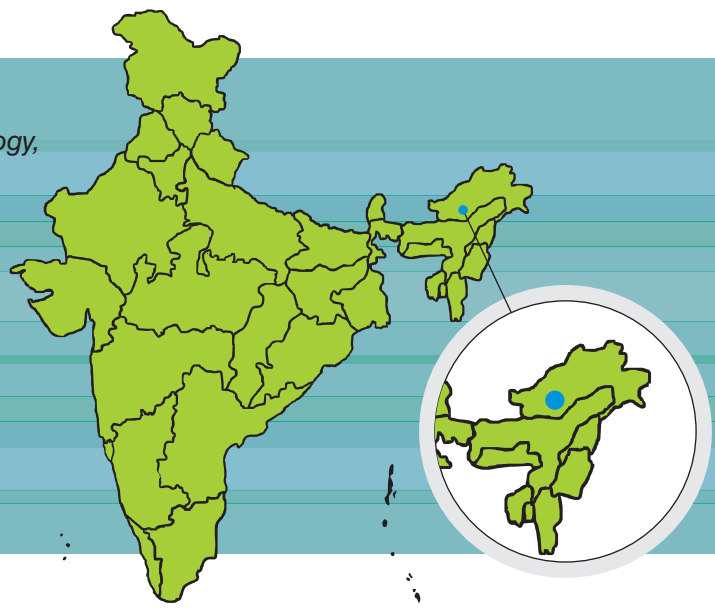
Funding Source
Department of Science and Technology, Government of India

Investigators
Shri Gopi G.V. and Dr. Bilal Habib

Researchers
Salvador Lyngdoh and K. Muthamizh Selvan

Date of initiation
April 2009

Date of completion
April 2012



Objectives

The objectives of the project are to :

(i) Estimate the abundance and population structure of the dhole and its prey species in protected areas of western Arunachal Pradesh.

(ii) Examine the predation patterns of the dhole packs on the different prey species.

(iii) Quantify the current people-wild dog conflicts by assessing the livestock depredation by dholes and retaliatory killing by local people.

Progress

Intensive camera traps were laid (2600 trap nights) in the study area. The total numbers of dhole, tiger and leopard photographs were 26, 32 and 20, respectively. Estimation of the populations of the dhole, tiger and leopard is underway. Prey abundance estimation showed a low density of prey species. Line transects were surveyed (n = 20, 194 km) to estimate prey densities. The densities of wild pig (*Sus scrofa*), barking deer (*Muntiacus muntjak*), gaur (*Bos gaurus*) and sambar (*Rusa unicolor*) were 5.85 ± 1.31 km^2, 2.83 ± 0.69 km^2, 5.28 ± 1.24 km^2 and 5.56 ± 1.23 km^2, respectively. A total of 354 scats of dhole, tiger and leopard were analysed. The diet overlap of the dhole was 81.67% with the tiger and 44.52% with the leopard. For the dhole, the prey preference was in the following order: wild pig > barking deer > sambar. The total ungulate biomass was 3969.6 km^2.

A total of 208 households from 25 villages in the eastern, northern and north-eastern parts of Pakke Tiger Reserve (PTR) were visited to investigate the socio-economic status and human-wildlife conflict through a set of open and close ended questions. Questions pertaining to household income, education, awareness and willingness to conserve were asked through an open ended questionnaire survey.

For the first time, photographic evidence has been obtained of two rare cats whose distribution included Pakke Tiger Reserve (PTR).

Outputs and Outcomes

(I) Recent records of the Asiatic golden cat and marbled cat in PTR.

(ii) Completion of transects and data collection through camera traps.

(iii) Overall sampling effort of 20-30% of the households relating to human-wildlife conflicts. The target indigenous communities were the Nishi. The proportion of mithun depredated by a large predator was the highest (>20%), and the wild dog accounted for a major proportion (>70%) of this depredation. The depredation was high near north-eastern PTR (56.02%), medium in northern PTR (36.64%) and low in eastern (12.32%) PTR.

Milestone

Establishing baseline data for PTR. Conflict data will be used to arrive at conclusions so as to delineate areas of high conflict.

Camera Trap Photograph

Global Experiments on Savanna Tree Seedlings in Sariska Tiger Reserve, Rajasthan

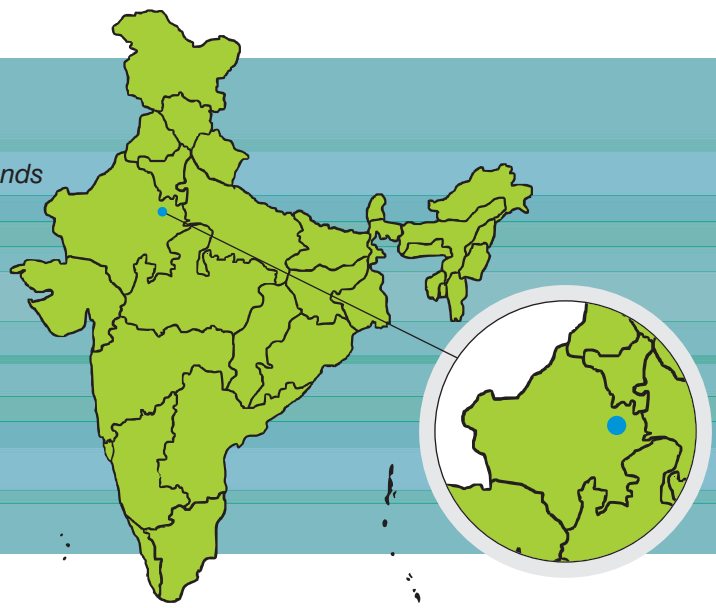
Funding Source
Wageningen University, The Netherlands

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

Researcher
Priyanka Bhatt

Date of initiation
April 2009

Date of completion
August 2011



Objectives

The objectives of the project are to :

(i) Study the response of savanna tree seedlings to resources (water, nutrients, light).

(ii) Study the competition from grasses for these resources and their ability to tolerate defoliation.

Progress

The field experiment at Sariska Tiger Reserve, Rajasthan was initiated in April 2009, and the setup was established according to the project proposal. The tree species and grass species selected for the experiment were *Acacia leucophloea, Anogeissus pendula, Balanites aegyptiaca, Butea monosperma, Lannaea corromandelica, Zizyphus mauritiana, Chloris dolychostachya* and *Heteropogon contortus. Hardwickia binata* was included as another target species to understand the response of a humid savanna species in dry savanna vegetation. The seeds for these species were collected locally in the season preceding the initiation of the experiment. These seedlings were raised in the greenhouse that was constructed near the enclosure site. A 50 m × 50 m plot was chosen and prepared for the field experiment by clearing the native vegetation by uprooting trees, shrubs and grasses, and macro-herbivores were kept out of the plot by wire mesh fencing on all sides. A 200 m pipeline was laid down from the nearby well for water treatments. The plot was marked and pegged, and the subplots were laid out in April 2009. The rain sheds and light sheds were constructed on the individual plots. Once the seedlings were established, four seedlings of all the seven target species were transferred from the greenhouse to the subplots only after the onset of the monsoon (rainy season), and initial measurements such as seedling height, length, basal diameter, number of leaves and condition of cotyledon were recorded for all the seedlings. The seedlings were planted in August 2009. They were subjected to various nutrient, water, grass, light and defoliation treatments according to the requirements of the experiment. The above seedling parameters were recorded every month. Also, grass subplots were harvested every four weeks by clipping the above ground biomass, bagged, oven-dried and weighed.

Data on seedling parameters with respect to growth were collected while the specified treatments were

being administered, for a period of 6 months. The youngest fully grown leaf of each individual was scanned at the start and end of the experiment. At the end of the experiment all the seedlings were clipped at ground level, bagged, oven dried at 70°C for 48 hours and weighed for dry mass. After the completion of the first year of the experiment, the plots were left undisturbed, and the enclosure was prepared for the second year of experimentation. The seeds that were collected in April-May 2010 were sown in seedling bags in the greenhouse near the experimental site. The rain sheds and light sheds were repaired, and the soil was manually cleared for weeds, undesirable grasses and seedlings during May-June 2010. After the onset of the monsoon in the first week of July, the germinated seedlings were planted at the experimental site in a design oriented mannerin which two seedlings of all species were planted in each treatment plot. In this second year, two new seedlings and two seedlings of the previous year of each target species were monitored for 0-1 years and 1-2 years for data on seedling growth parameters, respectively. The youngest fully grown leaf of each individual was scanned at the start and end of the experiment. Data with respect to growth were collected every 4 weeks while the specified treatments continued, for a period of 6 months. At the end of the experiment all the seedlings were clipped at ground level, bagged, oven dried at 70°C for 48 hours and weighed for dry mass.

Outputs and Outcomes

The first year seedling growth data were analysed by performing ANOVA using SPSS 16.0. The treatments blocks were compared with the control block for significant differences in treatments considering water, defoliation, shade and block as fixed factors and including all two way and three way interaction terms. The three models that were used for the analysis were the following. For water: $y = B_0 + B_1$*Water + B_2*Grass + B_3*Nutrient + Interactions. For Shade: $y = B_0 + B_1$*Shade + B_2*Grass + B_3*Nutrient + Interactions. For Defoliation: $y = B_0 + B_1$*Defoliation + B_2*Grass + B_3*Nutrient + Interactions. Each of the seven species were analysed for different treatments for parameters such as stem length, stem height, stem basal diameter, total leaves, total mass and leaf mass fraction. The mean stem height for *Butea monosperma, Hardwickia binata, Lannea coromandelica* and *Zizyphus mauritiana* was highest for defoliation treatment followed by natural rainfall treatment. *Anogeissus pendula* had a higher mean stem height for shade treatment block followed by control plot. The rest of the species had a lower sample size. Hence no conclusions could be drawn for them.

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Assessment of Banj Oak Forests and Their Conservation Status in Uttarakhand

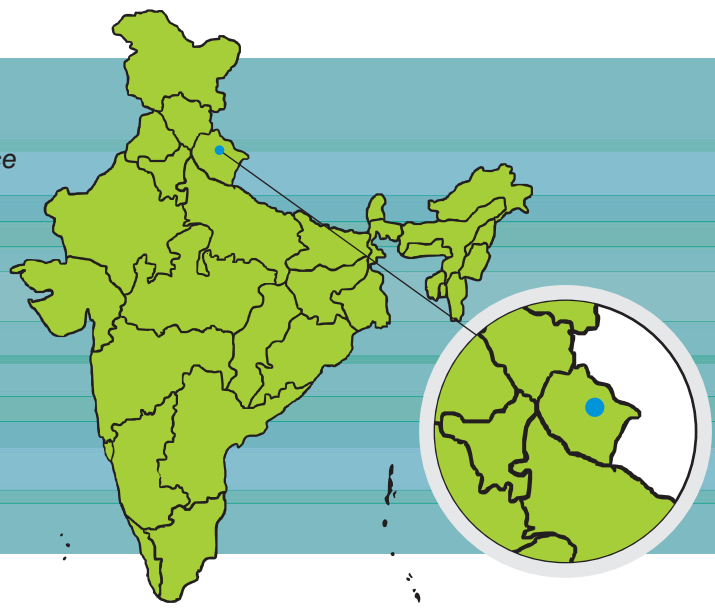
Funding Source
Uttarakhand State Council for Science and Technology

Investigator
Dr. G.S. Rawat

Researcher
Gajendra Singh

Date of Initiation
June 2009

Date of Completion
June 2011



Objectives

The objectives of the project are to :

(i) Generate base maps showing the distribution of banj oak (*Quercus leucotrichophora*) forests in the state of Uttarakhand.

(ii) Assess the status of oak forests in various districts.

(iii) Mark the zones of transition between oak and pine forests.

(iv) Evolve conservation and management strategies for the oak forests.

Progress

The banj oak (*Quercus leucotrichophora*) forms a major component of the temperate broadleaf forest in the mid-elevation (1200-2200 m asl) zone of Uttarakhand. This species is highly preferred by the local inhabitants for fuel wood, fodder and timber. Besides forming the climatic climax, the banj oak provides numerous ecosystem services. Owing to increasing anthropogenic pressures, the oak forests are degrading rapidly, and in several places more xeric species such as the chir pine (*Pinus roxburghii*) are said to be replacing the oaks. During the reporting period, ground truth verification of distribution maps was completed.

Outputs and Outcomes

Preliminary analysis reveals that banj oak forests in Uttarakhand State occupy an area of about 1241.96 km^2, of which 714.61 km^2 falls under reserve forests (RF) and 527.35 km^2 lies outside them.

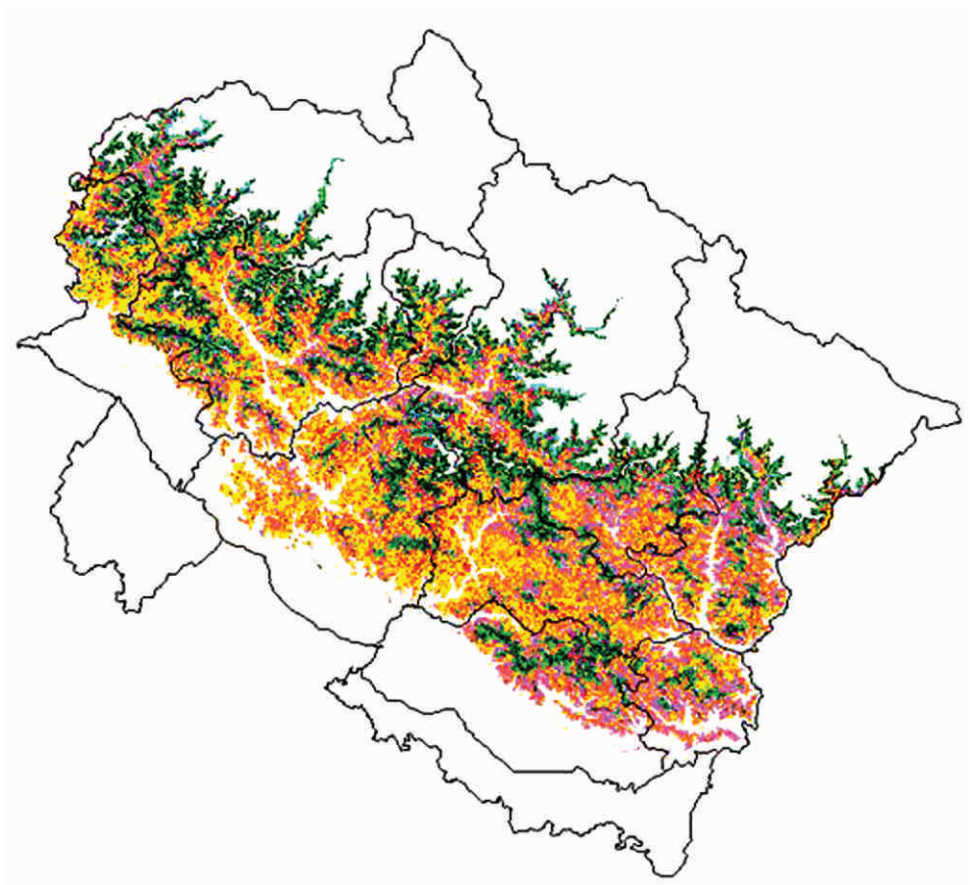
Banj oak forests are distributed mainly in two regions in the state:

(i) The Lesser Himalaya, e.g., Nainital, Chandak, Chakrata, Mussoorie, Chamba, Lansdowne, Pauri, Thailisain and Gairsain.

(ii) The Greater Himalaya, e.g. parts of Nanda Devi Biosphere Reserve (NDBR), Kedarnath Wildlife Sanctuary (KWS) and Govind Wildlife Sanctuary (GWS). Extensive banj oak forests can be seen in Nainital, Bhawali (Nainital), Barabe, Chandak, Ghandhura, Saurlekh (Pithoragarh), Hingla Devi, Kanteshwar (Champawat), Reema, Dharamghar (Bageshwar), Radi top-Kafnail (Uttarkashi), Khirsu, Thalisain (Pauri), Mohankhal (Chamoli), Mussoorie, Chakrata (Dehra Dun), Holanakhal,

Chamba and Dhudhali (Tehri) areas. is the forests are mixed with chir pine at the lower (<1800m), south facing slopes. The banj forests around Bin-Munakot, Sandev-Chaubati (Pithoragarh), Debidhura (Champawat), Saharfatak (Almora), on the way to Mukteshwar (Nainital), Bhaiti (Chamoli), Dhanolti-Chamba (Tehri), Kempty (Dehra Dun), Taluka, Sankari (Uttarkashi), Chirbatiya and Jaal-Chaumansi (Rudraprayag) are heavily degraded due to excessive lopping for fodder, fuelwood, orchards and forest fires. The better conservation status and higher density of the banj oak in a few pockets can be attributed to the availability of other fodder species and relatively low human pressure. A baseline map showing the distribution of banj oak forests in Uttarakhand has been generated. Banj oak forests occupy 1241.96 km^2 in Uttarakhand, which is 5.07% of its forest cover and 2.32% of its geographical area.

Fig. Vegetation map of Uttarakhand showing the distribution of Banj oak forests



Monitoring Source Population of Tiger in Corbett Tiger Reserve

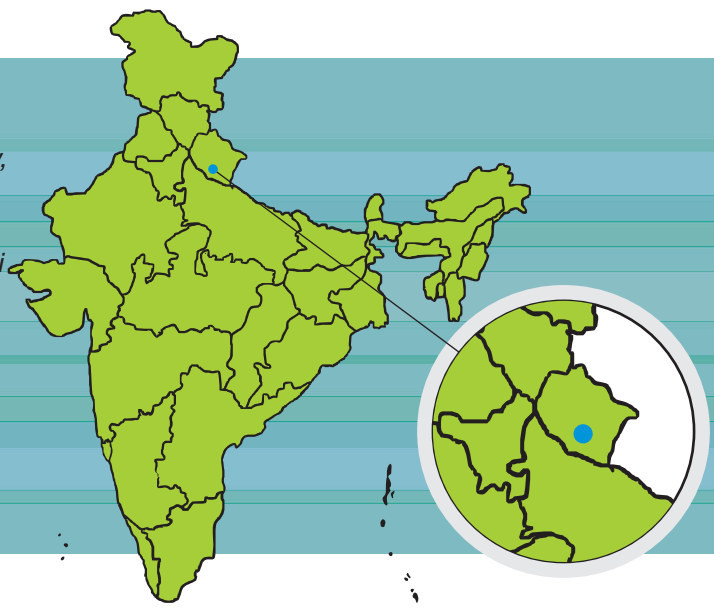
Funding Source
National Tiger Conservation Authority, New Delhi

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 estimate the density.

(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.

(v) Suggest management recommendations for effective conservation of tigers in the tiger reserve.

Progress

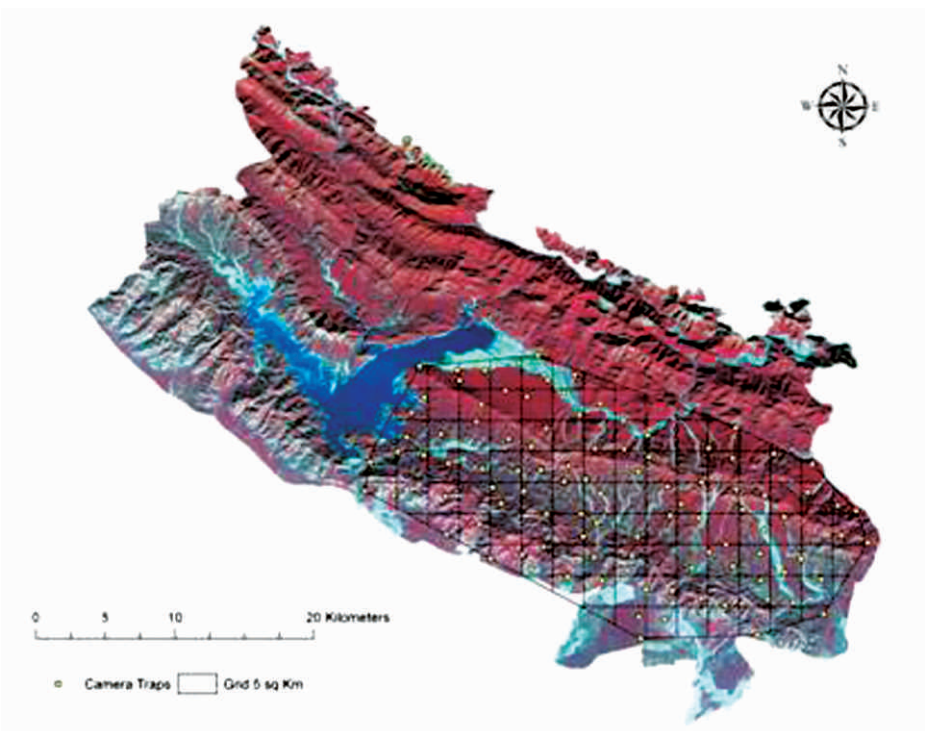
Ecological studies conducted in this landscape have reported snapshots of the tiger population status (19_{Mean} ± 0.54_{SE}/100 km^2 in 2006-2007). Monitoring the population on an annual/seasonal basis will provide us with not only the number of tigers, but also an indication of changes in tiger numbers along with an understanding of the factors that are responsible for the changes. Hence, under Phase IV, the team is concerned with detecting change, establishing its direction and measuring its extent and intensity in Corbett Tiger Reserve (CTR). This will enable us to detect site-specific changes in time to address them with timely intervention by management. Camera trap based capture-recapture (Pollock's robust design) was conducted in two successive blocks and continued seasonally (summer (May-July 2010) and winter (December-January 2010-2011)) each year for a period of 30-45 days per block to ensure population closure in an area of 466.5 km^2 (MCP) to estimate the population size, density and survival of the tiger.

A total of 103 camera locations were sampled in the area identified based on our reconnaissance survey and the local knowledge of the forest staff. An effort of 9064 trap nights yielded 666 photographs of 101 individual tigers. Closed population estimators selected M*th* as the best-fit model, thereby accounting for time-induced heterogeneity. The population estimate (# (S.E.)) computed using the M*th* Chao estimator was 102 (2.9). The ½ MMDM density estimate (# (S.E.)) per 100 km^2 was 20.9 (2.2). Under the spatial likelihood model, the density was 17.8 (1.40). The present results were compared with the estimates obtained in 2006-2007, using the

same MCP. The M*th* Chao estimator based population estimate of 127 (9.4) and density estimates using ½ MMDM of 20.3 (1.3) and 15.1 (2.26) were similar (95% C.I.). Thirty-one of the previously marked tigers (2006-2007) were captured during the present session, i.e, 30% (of 102 tigers, 2006-2007) survived and 69% (of 101 tigers, 2010-11) of the present individuals captured are new individuals (have been captured for the first time). The 'Monitoring System for Tigers-Intensive Patrolling and Ecological Status' (MSTrIPES) is proposed to be implemented in CTR as part of this project. The methods were designed and data collection commenced.

Outputs and Outcomes

Estimates of density made continuously at the same site over multiple years are very useful for understanding and managing the populations of large carnivores. Intensive camera trapping in the same area of CTR, which is the source population for the Terai-Shiwalik landscape or the Terai-Arc Landscape (TAL), will bring forth trends in the tiger population by monitoring the abundance and density of the tigers over time.



Population Estimation and Ecology of the Tiger in Sunderbans Tiger Reserve

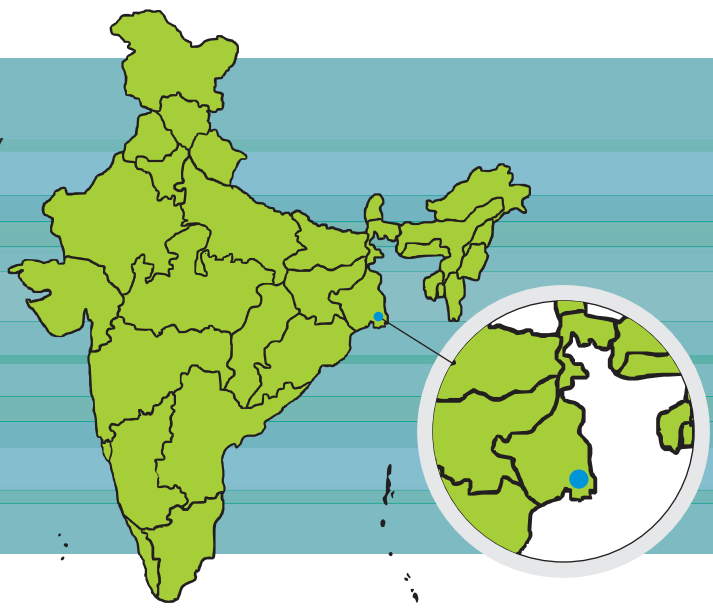
Funding Source
National Tiger Conservation Authority and West Bengal Forest Department

Investigators
Dr. Yadvendradev Jhala and Shri Qamar Qureshi

Researchers
Manjari Roy and Dipanjan Naha

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 ranges of tigers.

(v) Suggest management recommendations for effective conservation of tigers in the tiger reserve.

Progress

The mangrove habitat of Sunderbans provides a formidable challenge for conducting a scientific study owing to the ever present threat from tigers, absence of roads and trails inside the forests and difficulties in employing standard survey methods, which usually perform well in other habitats. All these factors, along with the isolated tiger population in this zone, make this an important tiger conservation unit with a high degree of threat requiring continuous monitoring and management inputs.

Outputs and Outcomes

A total of four tigers, three adult males and an adult female, were tagged with satellite radio-collars as part of an ongoing study on the Sundarban tigers. The 95% fixed kernel (FK) home ranges of the males varied from 75.3 to 156.3 km^2, while the 100% maximum convex polygon (MCP) varied from 92.9 to 207.1 km^2. In the case of the female the 95% FK and 100% MCP were computed at 474.9 km^2 and 335.8 km2, respectively. The average home range was 205.6 km^2 (SE 45.6) (95% FK) and 189.1 km^2 (54.6) (100% MCP). The average distances moved daily, estimated at 4.64 km (SE 0.41), seem to be more or less similar among all the four tigers.

Due to the difficulty of walking in the mangrove forests and locating game trails for setting camera traps, camera traps could not be deployed in the systematic grid based approach used across India. Instead, camera traps were set up at strategic locations, near fresh and brackish water ponds, and attractants were used to lure tigers to our camera stations. The tiger population was estimated under a

mark-recapture framework with closed population estimators in an area of about 200 km2.

The best model selected by CAPTURE was model Mh (incorporating individual heterogeneity), and the population estimate was 11 (SE 3) tigers. The home range radius of four satellite-radio-tagged tigers was 6 km. This was used to calculate the buffer width around the camera trapped polygon, giving an area of 438 km^2. After applying a habitat mask bounded by channels >1 km, the effectively camera trapped area was 257 km^2. The tiger density was computed to be 4.3 (SE 0.3) tigers per 100 km^2. Since the tiger occupied area of the Sunderbans Tiger Reserve was 1645 km^2 and the variation of tiger signs was similar to that found within the camera trapped area, it was possible to extrapolate this tiger density across the reserve without much loss of accuracy. This first quantitative assessment estimates the number of tigers at around 70 (64 to 90) tigers for the Sunderbans Tiger Reserve.

Due to the unique nature of the tidal washing of the mangrove, there are naturally created strips of mud flats that are ideal for recording tiger pugmarks. These mud strips are regularly washed by the changing tides every day. Tigers regularly cross these mud strips in channels and creeks to commute between mangrove forest patches. Thus, the density and decay rates of tiger pugmark signs can easily be estimated in the Sunderban habitat. With radio-collared tigers, it was possible to estimate the pugmark sign deposition rate based on the daily movement rates and paths of tigers.

The density of prey species in Sajnekhali Wildlife Sanctuary was calculated using DISTANCE, and the delta variance method gave estimates of 13.3 chital/km^2, 1.2 rhesus macaques/km^2 and 1.8 lesser adjutant storks/km^2.

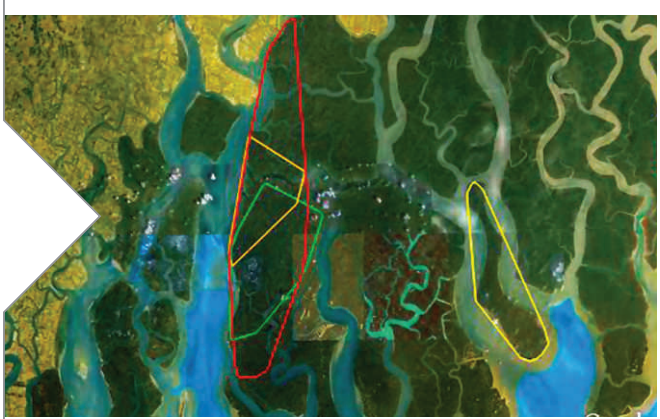


Figure 1. Home ranges of collared tigers (n=4) in the Sunderbans.

Figure 2. A camera trapped picture of two cubs in the Sunderbans.

Figure 3. A camera trapped picture of a radio-collared tiger in the Sunderbans.

Monitoring Source Population of Tiger in Kanha Tiger Reserve (Phase IV)

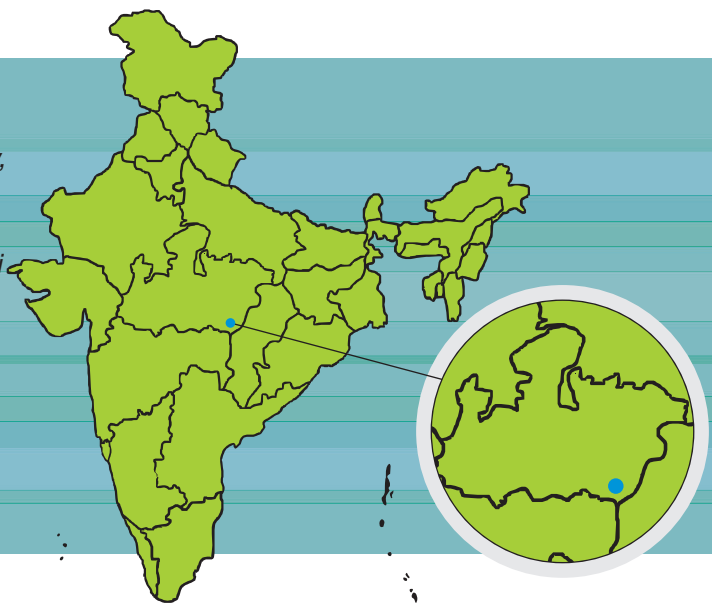
Funding Source
National Tiger Conservation Authority, New Delhi

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 will

  (a) Estimate the tiger population within selected areas of the reserve.

  (b) Obtain survival and mortality information through a mark-recapture study.

(ii) Monitor prey, co-predator populations and the condition of the habitat in the tiger reserve.

(iii) Gain an understanding of tiger dispersal patterns.

Progress

An area of 250 km^2 with 56 camera trap stations was selected and was operational from May 19, 2010 to July 14, 2010 in Kanha-Mukki block, while in Supkhar Block 38 camera trap stations were selected and were operational from November 15, 2010 to December 20, 2010 in an area of 150 km^2. Each camera trap station was in a 5 km^2 grid. Line transect surveys have been carried out for estimation of prey populations on the basis of visual detection of animals.

Camera trapping in the Kanha-Mukki block was repeated again in March-April, 2011 under the tiger monitoring protocols of Phase IV. Data entry and analysis for the repeated block is in progress.

Highly polymorphic microsatellite loci or 'DNA fingerprints' are being used to identify individual tigers and detect patterns of gene flow in the study area (Figure) through genetic analysis. Panels of seven (for scat DNA extracts) to 22 microsatellite loci markers (in blood and tissue from radio-collared tigers) are being used for this purpose. The markers (3-6 alleles per locus, heterozygosity ~0.30-0.90) exhibit robust parent-offspring-sibling pair detection values (LOD score of +3.49 between female 7 and its cub) and a very low probability of sibling identity *(Pid-sibs)* of 1.3×10^{-7}, which will ensure unambiguous identification of individuals. None of the loci deviated from the Hardy-Weinberg expectation or exhibited a linkage disequilibrium between any random pair of loci. While genotyping scat DNA extracts, enzyme digestion of ~187 base pairs (bp) of mitochondrial cytochrome b

polymerase chain reaction (PCR) products is used to identify tiger samples from leopard samples, based on the presence of two bands of 120 and 67 bp in the former but not the latter. So far, 80 genotypes have been obtained from 200 scats and 12 blood samples from the central Indian tiger reserves of Kanha, Pench, Satpura, Bandavgarh and Achanakmar. More scat samples are being analysed for a comprehensive understanding of the genetic structure of the population.

Outputs and Outcomes

A total of 27 tigers were captured in Kanha-Mukki, and 10 tigers were captured in the Supkhar area. The populations and densities of the two blocks (Kanha-Mukki and Supkhar) were estimated separately and compared with the population estimate of 2006 within the same camera trapping polygon.

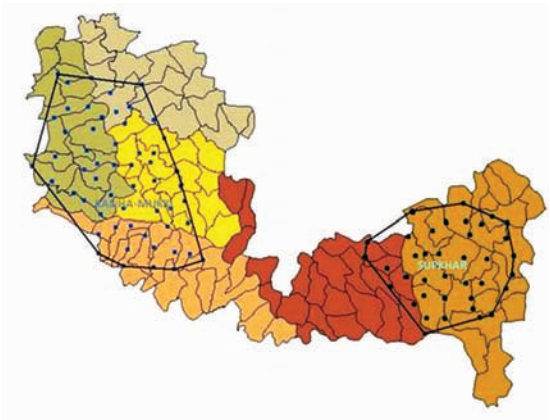


Table 1 : *Density and population estimates of tigers in Kanha Tiger Reserve*

CT sampling area	Model	$\hat{N}$	$\hat{D}$ (1/2 MMDDM) (1/2MMDM)/100 km^2	$\hat{D}$ (MLSECR) ((MLSECR)/100 km^2)
Kanha-Mukki	M_h	28 (SE 0.9)	6.83 (0.60)	5.62 (SE 1.11)
Supkhar	M_h	10 (SE 1.7)	2.75 (0.76)	2.08 (SE 0.68)

$\hat{N}$ population estimate; $\hat{D}$, density estimate; ^{SE}, standard error; ^{MMDM}, mean maximum distance moved by animal; ^{MLSECR}, maximum likelihood spatial capture recapture.

The population estimate of 2010 within the same area as that of the camera trap polygon of 2006 indicated that the population has declined by 37% in the Kanha-Mukki area while it has increased by 80% in Supkhar block.

Table 2 : *Comparison of population estimates of tigers in Kanha Tiger Reserve*

CT area	2006	2010
Kanha-Mukki	45 (SE 4.5)	28 (SE 0.9)
Supkhar	5 (SE 0.39)	9 (SE 1.5)

Ecological Monitoring of Tiger Population in Panna Landscape, Madhya Pradesh

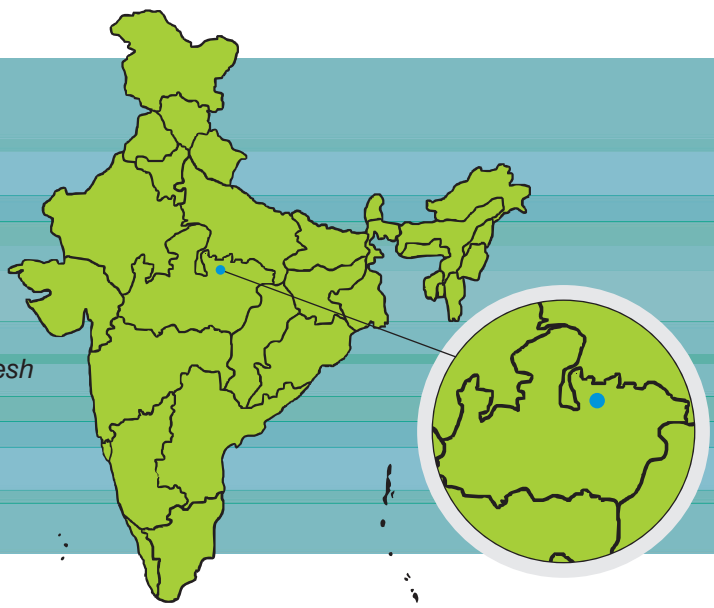
Funding Source
Madhya Pradesh Forest Department

Investigators
Dr. K. Ramesh, Shri . S. Sen,
Dr. J.A. Johnson and Field Director,
Panna Tiger Reserve

Researchers
Ravi N. Parmar,
Mriganka Shekhar Sarkar and J. Yogesh

Date of Initiation
February 2010

Date of Completion
January 2014



Objectives

The objectives of the project are to :

(i) Monitor and study the growth of the translocated/reestablished tiger population in Panna Tiger Reserve, including the genetic structure.

(ii) Understand the dynamics of co-predator and prey populations in relation to the tiger occupancy pattern and other management interventions.

(iii) Study the landscape ecology of the tiger, incorporating human interface issues and ecological correlates linked to economics and system services.

Progress

The project continued with regular monitoring of the translocated tigers (two tigresses from Bandhavgarh TR and Kanha TR, and a tiger from Pench TR) and other specified activities. All the tigers were radio-collared-the first two females with VHF/UHF/GPS collars and the male with a VHF/GPS satellite collar, designed to be monitored based on the home-in and triangulation methods. However, except for the Kanha tigress, whose radio-collar stopped functioning, monitoring is being carried out by radio-tracking. The Kanha tigress is being monitored by active searching for indirect evidence, such as pugmarks/scats/scrapes, on a daily basis. Sign surveys were undertaken within the home ranges of the tigers, and three sessions (15 days each) of camera traps covering 240 km^2 in four ranges (Panna, Hinauta, Gairighat and Madla) were completed. During the reporting period, in March 2011, an orphaned tigress that was raised in captive and semi-wild conditions for over 5 years in Kanha TR was released in Panna TR, as an effort to rehabilitate the tigress and to strengthen the founder population. This animal was fitted with a VHF/GPS satellite collar and is being monitored round the clock. The finer details of its movement patterns and behavioural responses are being recorded. Through systematic collection, over 140 scat samples of tigers and their cubs were gathered. They were processed to assess their feeding habits and to establish their genetic profile.

Outputs and Outcomes

The three animals introduced in 2009 have established themselves well in the new sites and have responded positively with initial breeding successes. The tigress that was introduced recently from a semi-wild condition in Kanha TR appears to have adapted to the new site, although the general occupancy pattern and behavioral traits are far from the pattern observed in entirely wild tigers. Interestingly, it has made kills of wild ungulates and mated with the male tiger there in early July 2011. Of the litter of four cubs produced by the Bandhavgarh female in March 2010, two are surviving, while of the litter of three cubs produced by the Kanha female in October 2010, all are surviving. With these cubs, the present population size of tigers in Panna TR is nine, with four adults (one male and three females) and five offspring (three males, one female and one to be confirmed). The home range estimates obtained from the 100% MCP method for the tigers (from Bandhavgarh, Kanha and Pench TRs) were 160 km^2, 228 km^2 and 230 km^2, respectively, in 2009, during the initial exploration period, and 66 km^2, 57 km^2 and 89 km^2, respectively, in 2010, after they had settled down in suitable habitats. The recently introduced female, which is in the process of re-establishing itself in the wild, is exploring a very small proportion of the area, and its movements are centred on the release site. The events unfolding in Panna TR, with the breeding of translocated tigers and translocation of the tigress raised in captive and semi-wild conditions have provided new insights into tiger biology, with implications for tiger conservation efforts in the country and elsewhere in its distribution range.

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Impact of Global Change on Species Composition in Western Himalaya-Himachal Pradesh

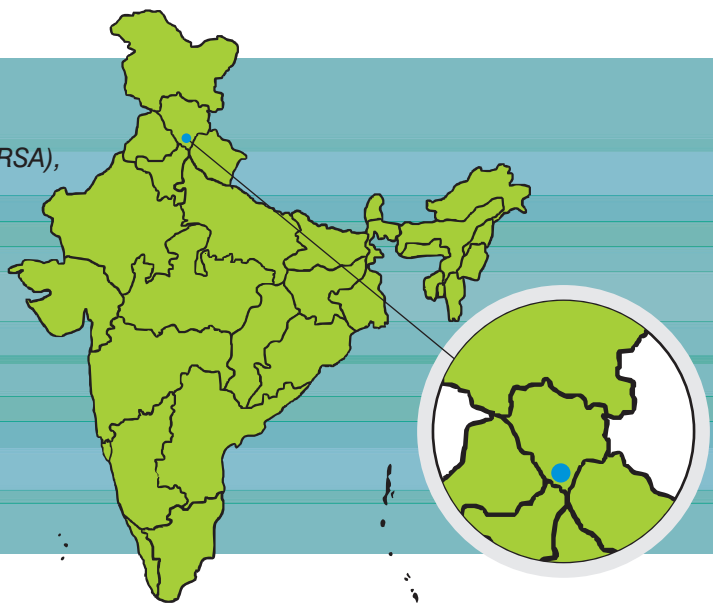
Funding source
Department of Science, National Remote Sensing Agency (NRSA), Hyderabad

Investigators
Dr. B.S. Adhikari, Dr. G. Talukdar and Dr. G.S. Rawat

Researcher
Pushkar Sharma

Date of Initiation
February 2010

Date of Completion
January 2013



Objectives

The objective of the project is to study the impact of global changes such as climate and land use changes on the floristic diversity of Himachal Pradesh, with emphasis on changes in species composition.

Progress

Sirmour District of Himachal Pradesh has been selected for an intensive study based on its wide range of altitudes from 410 to 2260 m. Fifty-two different sites were selected for studying the plant community composition and structure. Stratified random sampling was carried out in different selected representative sites.

Outputs and Outcomes

The preliminary results suggest that a total of 13 different forest communities were identified based on IVI values, *viz*. the *Acacia catechu, Anogeissus latifolia, Bombax-Terminalia, Cedrus deodara, Cornus macrophylla, Eucalyptus globulus, Eucalyptus-Shorea, Shorea-Mallotus, Pinus roxburghii, Pinus wallichiana, Cedrus deodara, Quercus leucotricophora, Shorea robusta* and *Syzygium cerasoides* communities. The total density was highest for the Cedrus deodara community and ranged from 350 to 810 trees ha^{-1}, followed by the Shorea-Mallotus community (330-840 trees ha^{-1}). The total basal area was highest for the *Cornus macrophylla* community (62.5 m^2 ha-1), followed by the *Shorea robusta* community (12.0-55.8 m^2 ha^{-1}), *Quercus leucotricophora* community (6.4-35.8 m^2 ha^{-1}) and *Cedrus deodara* community (21.7-35.9 m^2 ha^{-1}).

Land Use and Land Cover Dynamics and Impact of Human Dimension in Lower Ganga Basin

Initiated Projects

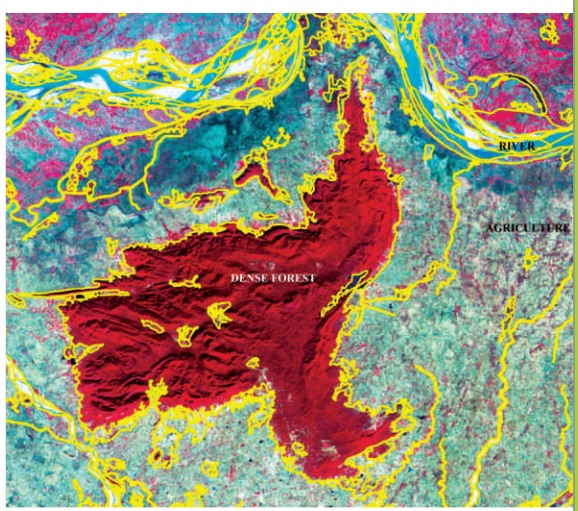
Funding source
National Remote Sensing Centre (NRSC), Hyderabad, Department of Space

Investigator
Dr. Gautam Talukdar

Researcher
Indranil Mondal

Date of Initiation
August 2010

Date of Completion
August 2012



Onscreen Visual Interpretation for Parts of Bihar (Munger)being Performed at 1:250,000 Scale using IRS Liss III Imagery.

Objectives

(i) To generate a land use/land cover database with a uniform classification scheme for 1984-1985, 1994-1995 and 2004-2005 using satellite data at a 1:250,000 scale.

  (a) Land use and land cover dynamics.

  (b) Impact of human dimension.

Progress

Satellite data for years 1985, 1995 and 2005, in the form of images, were procured from National Remote Sensing Centre, Hyderabad. These data were corrected for geometric and radiometric errors. Progress is being made with the following:

(i) Quality control of the Vector Land Use Landcover (LULC) data (in shape files) that have been generated for the above years.

(ii) Climate, soil, elevation and census data have been collected and are being made GIS ready.

Outputs and Outcomes

A land use/land cover database for the Lower Ganga Basin has been completed for the years 1985, 1995 and 2005. The expected outcomes are:

(i) Identification of the basin-wise spatial distribution of land use/land cover and its changes over the last 20 years.

(ii) Identification of drivers for land use change.

Ecology and Conservation of Himalayan Wolf

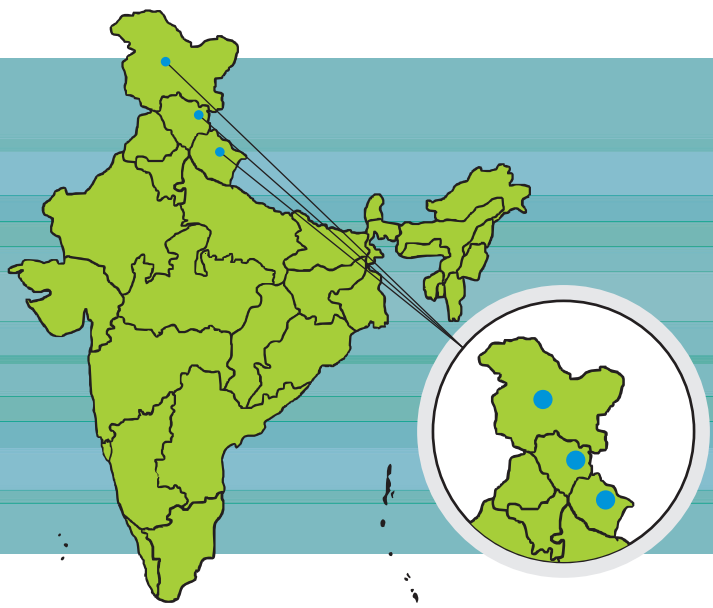
Funding source
MBZ Species Conservation Fund

Investigators
Dr. Bilal Habib and Dr. Y.V. Jhala

Researcher
Shivam Shrotriya

Date of initiation
August 2010

Date of completion
August 2015



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Objectives

The objectives of the project are :

(i) To collect baseline data on the extent of the distribution of the Himalayan wolf.

(ii) To identify the protected areas occupied in the landscape.

(iii) To determine the current status of the Himalayan wolf in the wild.

Progress

Villages around and/or inside the protected areas of the Trans-Himalaya, selected on the basis of their closeness to the potential habitat of the species, will be surveyed to understand the conflict level in livestock predation by the Himalayan wolf and other carnivore species. Their presence in different areas and localities can be ascertained and sites potentially occupied by the Himalayan wolf in the landscape can be identified on the basis of the data generated during the survey. The survey will also gather information about the presence of other carnivore species and prey species such as the blue sheep and ibex. The reasons for and the level of the current and potential threats to the future of the species, attitude of the locals towards the species and their responses to the presence of the wolf and any relevant information regarding the habits and habitat of the wolf will be investigated. The questionnaire survey in the villages of Himachal Pradesh and in some parts of Uttarakhand has been completed. One national park and five sanctuaries of the Trans-Himalayan region in Himachal Pradesh and four national parks and two sanctuaries in Uttarakhand were visited, and the questionnaire survey was conducted in about 80 villages on the boundaries of these protected areas. Askot Wildlife Sanctuary in Uttarakhand and two other states (J&K and Sikkim) are yet to be visited.

Outputs and Outcomes

The preliminary results show the presence of the Himalayan wolf in Mayar Valley near Sechu-Tuan Nala Wildlife Sanctuary, Batul Valley and Kibber Wildlife Sanctuary in Himachal Pradesh, and Nanda Devi National Park and Askot Wildlife Sanctuary in Uttarakhand, where the survey is going on, could be the potential sites.

Ecology of Leopard *Panthera pardus* in Relation to Prey Abundance and Land Use Pattern in Kashmir Valley

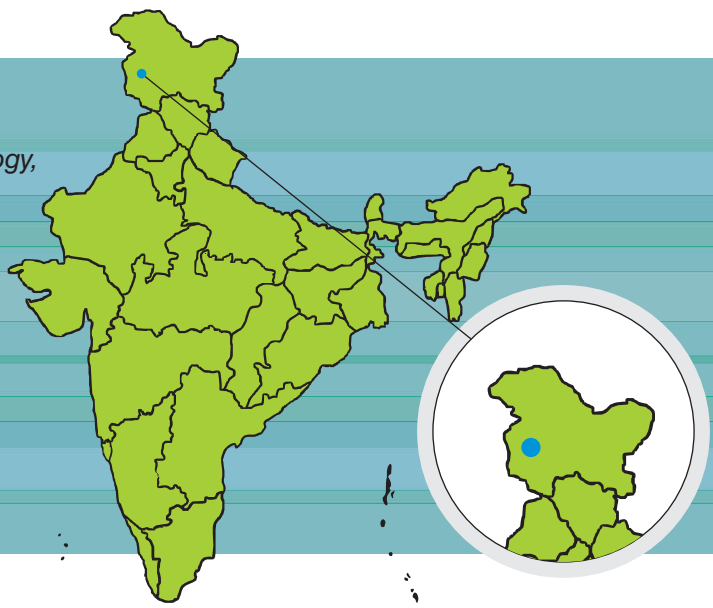
Funding Source
Department of Science and Technology, Government of India

Investigators
Dr. Bilal Habib and Shri Gopi G.V.

Researcher
Athar Noor and Zaffar Rais Mir

Date of Initiation
December 2010

Date of Completion
December 2013



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Objectives

The objectives of the project are to :

(I) Estimate the density, abundance and distribution of the leopard across different study sites.

(ii) Estimate the prey density across different sites and relate the density of the prey base to the leopard abundance.

(iii) Study the variation of food habits across different sites and seasons in Kashmir Valley.

(iv) Study the movement pattern, home range size and social organization of leopards across different sites.

Progress

A reconnaissance survey was started in January 2011. Trails and un-metalled motorable roads were walked in order to gather information about the mammalian fauna of the national park. Indirect evidence such as hoof marks of ungulates and pugmarks of the leopard and other macro-faunal elements were counted to account for the encounter rates across different parts of the national park. To

account for the dietary pattern and spectrum of the subject species, the common leopard *(Panthera pardus)*, scat collection has also been started, and 50 scats have already been collected from the nature trails and the roads. Analysis of the collected scats and other observations on the distribution patterns of the animals has not been done yet. Information gathering pertaining to the leopard-human conflict around Dachigam National Park and adjoining reserved areas has been started through questionnaire surveys, and this has not been analysed yet. A total distance of 66 km was walked on different trails and roads to gather information about the distribution and movement patterns of the different species.

Outputs and Outcomes

Encounter rates were generated in terms of evidence sighted per unit effort (distance travelled). Evidence of four species, viz. the Asiatic black bear, hangul, leopard and yellow-throated marten, was encountered with.

Diversity and Conservation of Endangered Fish Genetic Resources of Kalakad Mundanthurai Tiger Reserve, Tamil Nadu

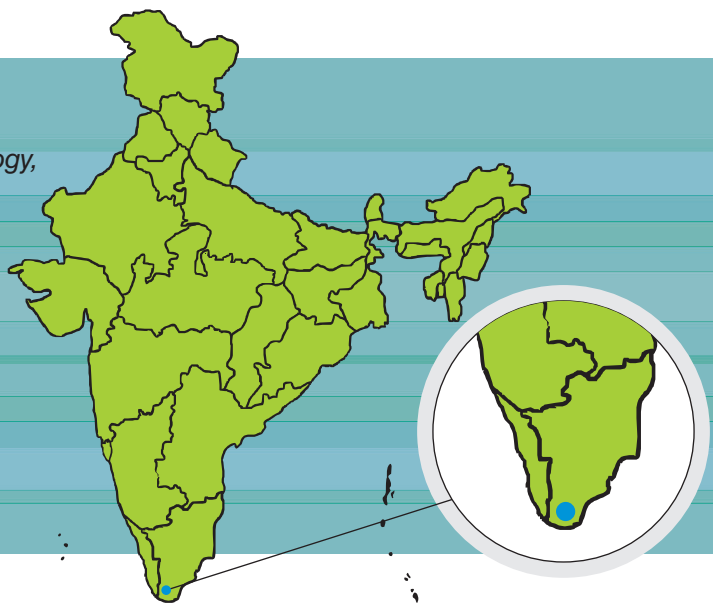
Funding source
Department of Science and Technology, New Delhi

Investigator
Dr. J.A. Johnson

Researcher
K. Kannan

Date of Initiation
December 2010

Date of Completion
December 2013



Objectives

The objectives of the project are the following :

(i) Inventorying the habitat and documenting the existing information on the endangered fish species of Kalakad Mundanthurai Tiger Reserve (KMTR).

(ii) Assessing the genetic diversity of the different populations of selected endangered species.

(iii) Breeding in captivity the endangered fish species chosen for conservation and rearing their young ones.

(iv) Restoration of endangered populations through species ranching.

Progress

Field sampling for species inventorying and habitat quantification was conducted between January and February, 2011. A total of 19 species of fish belonging to seven families and 15 genera were recorded from 25 streams in KMTR. The maximum number of species (S = 15) was recorded in Karayar stream. The family Cyprinidae constituted the dominant group (91.3%) in the assemblage

structure, followed by the family Bagridae (3.82%). The greatest numbers of cyprinid species were recorded from Thalayanai, Manimutharu, Valyaru and Karayar streams, which also harbour good numbers of big sized barbs, such as *Hypselobarbus curmuca, Hypselobarbus dobsoni* and *Tor malabaricus*. Water quality analysis showed that the Kakachi stream has a low water temperature (16.9°C) and the Narykadu stream has a high temperature (23.4°C) and that the pH value ranges from 6.7 to 7.9. The habitat inventory data showed that Kuleratee stream had a high proportion of the pools-riffles habitat (100%) and Chinnapullaru stream had a low level of this habitat (28.57%). Among the different substrate types bedrock was the dominant one observed in most of the study sites (60-70%), except at Poonkulum, Palavarathodu, Thylaru and Thooneyaur. Estimation of the habitat area and volume showed that the habitat volume was high in Thalaiyanai stream, in which there is a high density of fish (529 in 100 m reach).

Outputs and Outcomes

It was found that four species of fishes, *Gara kalakadensis, Horalabiosa joshuai, Puntius tambraparaniei* and *Puntius kannikattensis,* are endemic to the Tamiraparani river. A record of the mahseer *Tor malabaricus* from KMTR is a new finding from the present study.

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Monitoring of Re-introduced Gaur *(Bos Gaurus)* in Bandhavgarh Tiger Reserve, Madhya Pradesh

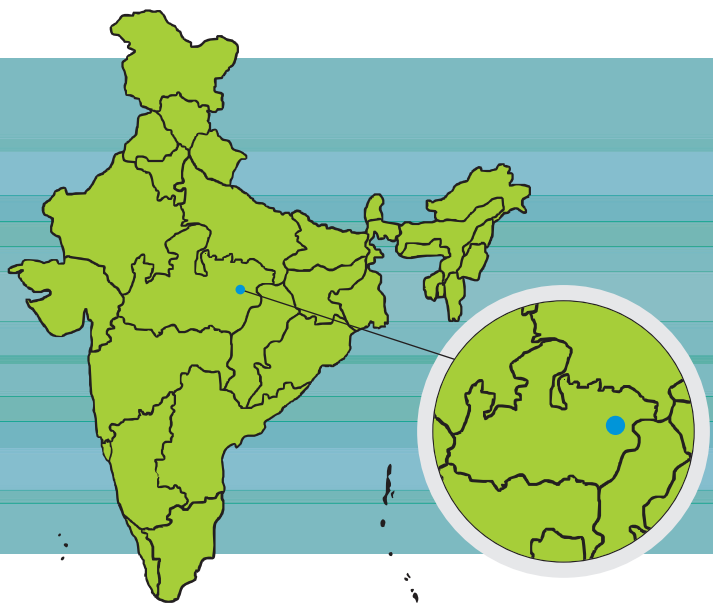
Funding Source
Madhya Pradesh Forest Department

Investigators
Dr. K. Sankar and Dr. Parag Nigam

Researchers
B. Navaneethan and Preeti S. Virkar

Date of Initiation
January 2011

Date of Completion
January 2013



Objectives

The objectives of the project are to :

(I) Understand the ranging pattern and home ranges of the reintroduced gaur in Bandhavgarh.

(ii) Collect information on the habitat use.

(iii) Understand the food habits of the gaur.

Progress

Nineteen gaur (14 females, 5 males) were captured in Kanha Tiger Reserve (from two different herds) and re-introduced in Bandhavgarh Tiger Reserve during January 2011. Of these, 12 individuals were fitted with radio-collars. Two adult males were fitted with GPS/satellite collars, and 10 individuals were fitted with VHF (very high frequency) radio-collars (nine females and one male). Initially, the animals were kept in a 2 ha enclosure for a week. On January 31, 2011 these animals were released in a larger, 50 ha, enclosure. The animals were kept in the larger enclosure till March 19, 2011. The gaur was monitored inside the smaller and larger enclosures from January 22, 2011 to March 19, 2011. The animals were released into the wild on March 20, 2011.

Outputs and Outcomes

Continuous monitoring of gaur was done based on the tracking of locations of each collared individual through homing in and triangulation methods. On each location of the radio-collared individuals the following parameters were recorded :

(i) Major vegetation type.

(ii) Major terrain type.

(iii) Density of trees (in 10 m radius circular plot).

(iv) Density of shrubs (in 5 m radius).

(v) Percentage of ground cover (in 1 m radius).

(vi) Wood cutting and lopping (10 m radius) in percentage.

(vii) Grazing (1 m radius) in percentage.

(viii) Weed abundance (1 m radius) in percentage.

(ix) Distance to the nearest waterhole/water body, road and village. List of food plants and plant

parts consumed by gaur, other ungulates and camp elephants were recorded through opportunistic sightings. Fresh as well as dry dung samples are being collected in order to identify the proportions of plants and plant parts eaten by gaur.

Significant Findings

(i) Existing capacity in mass capture of mega-herbivores was enhanced.

(ii) This was the first mega-herbivore mass translocation in the country.

(iii) This was the first time in the world that the gaur was re-introduced in its range.

(iv) A narcotic, namely etorphine hydrochloride, has been found to be suitable for immobilization of gaur. The use of short- and long-acting tranquilizers in the translocation operation proved to be effective in minimizing stress in the animals.

ACADEMIC AND TRAINING

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Academic Programme

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XII M.Sc. (Wildlife Science)

The XII M.Sc. (Wildlife Science) course commenced from June 26, 2009. Eleven students (nine Indians and one foreign national each from Nepal and Mongolia) undertook it. The candidates were selected through National Eligibility Test (NET) on merit. Eight students were awarded WII fellowships, and three students were self-sponsored.

During the reporting period, the students were taken to Kedarnath Wildlife Sanctuary for the High Altitude Ecology and Techniques Tour from April 27 to May 6, 2010. The teaching inputs for Semester III started from July 2010. As scheduled for Semester III, the students were taken for a training workshop at Delhi and Agra during July 27-31, 2010. They were taken to southern India (Tamil Nadu and Kerala) from September 27 to October 16, 2010 for the Conservation Practice and Management Tour. The objective of the tour was to train them in different wildlife techniques and provide them knowledge in identification of flora and fauna. The students undertook their field dissertation projects in different protected areas of the country as part of Semester IV from December 2010 to May 2011.

Dissertations Supervised

Divya Kaul, 2010. **Habitat correlates of leopard *(Panthera pardus)* movement in Wildlife Institute of India campus.** University of Chandigarh, Chandigarh. Supervisors : Dr. K. Ramesh and Dr. K. Sankar.

Khan, A.A., 2010. **Activity patterns of Ladakh urial in Hemis Shukpachan and Sumdho areas of Ladakh.** Forest Research Institute Deemed University, Dehra Dun. Supervisor : Dr. S. Sathyakumar.

Malemleima Ningombi, 2010. **Evaluating the efficacy of various sampling techniques for quantifying abundance of tricarinate hill Turtle *(Melanochelys tricarinata)* and evaluating its resting sites.** Forest Research Institute Deemed University, Dehra Dun. Supervisor : Dr. Bilal Habib.

Omkar Dhavale, 2011. **Mobilizing biodiversity data through digitization of specimen collections: A case study on the herpetological collection at the Wildlife Institute of India Vertebrate Museum.** Forest Research Institute Deemed University, Dehra Dun. Supervisor : Dr. K. Vasudevan.

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Sebastian, J., 2010. **Habitat utilization by Asiatic black bear *(Ursus thibetanus)* at Dachigam National Park, Kashmir.** Forest Research Institute Deemed University, Dehra Dun. Supervisor : Dr. S. Sathyakumar.

Shreya Dasgupta, 2010. **Home range and movement pattern dynamics of wolves in semi-wild landscapes in Deccan Plateau, Maharashtra, India.** TERI University, New Delhi. Supervisor : Dr. Bilal Habib.

Status of Doctoral Research in WII

- **Theses Submitted**

Gopi, G.V., 2010. **Nesting ecology of colonial nesting water birds at Bhitarkanika mangroves, Orissa.** Saurashtra University, Rajkot. Supervisor : Dr. Bivash Pandav.

- **Awarded**

Dave, Chittranjan, 2010. **Ecology of Chital *(Axis axis)* in Gir.** Ph.D. dissertation, Saurashtra University, Rajkot, India. Supervisor : Dr. Y.V. Jhala.

Vinay K. Bhargava, 2010. **Assessing the potential role of Coleoptera *(Insecta)* as bio-indicators in Simbalbara Wildlife Sanctuary, Himachal Pradesh.** Saurashtra University, Rajkot. Supervisor : Dr. V.P. Uniyal. Co-supervisor : Dr. K. Sivakumar.

Upamanyu Hore, 2010. **Diversity and structure of spider assemblages in Terai Conservation Area (TCA).** Saurashtra University, Rajkot. Supervisor : Dr. V.P. Uniyal.

- **Registered**

K. Muthamizh Selvan, 2010. **Ecology of sympatric large carnivores in Pakke Tiger Reserve, Arunachal Pradesh.** Saurashtra University, Rajkot. Supervisors : Dr. S.A. Hussain and Gopi, G.V.

Poudyal, K., 2011. **Ecology of galliformes in Khangchendzonga Biosphere Reserve, Sikkim.** University of Calcutta. Supervisors : Dr. S. Sathyakumar and Dr. G.K. Saha.

Training Activities

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XXXI P.G. Diploma in Wildlife Management

The course commenced on September 1, 2009. It had a duration of 9 months, and a total of 11 officer trainees of the rank of DCF/ACF and equivalent from India and abroad participated. During the reporting period, a 2-month modular training course on 'Integrated Wildlife Management Planning' (April 1 to May 31, 2010) was organised for lateral entrants. The Management Planning Exercise tour was conducted at Kanha Tiger Reserve. The trainees were exposed to field situations and management challenges at the tiger reserve. One lateral entrant from Madhya Pradesh joined this module. The trainees were exposed to various facets of the park, including its past management history and conservation strategies. The trainees were taken to the buffer zone and the forest patches connecting Kanha with Phen Sanctuary and Achanakmar to the east as well as Pench Tiger Reserve to the west. They also visited Pench Tiger Reserve.

The valedictory function was held on May 31, 2010. Shri A.S. Negi, former Chief Wildlife Warden, Uttarakhand was the chief guest on this occasion. He presented the awards and prizes to the officer trainees. Officer trainees were awarded the P.G. Diploma in Wildlife Management on their successful completion of the course. The following awards and prizes were given to officer trainees:

The Institute's Gold Medal for the 'Top Trainee' was awarded to Dr. Vaibhav C. Mathur; the Wildlife Preservation Society Silver Medal for the 'Second in Merit' was awarded to Shri Maneesh Mittal; the silver medal for the 'Best All Round Wildlifer' was awarded to Shri A. Periasamy; the N.R. Nair Memorial Silver Medal for the 'Best Management Plan' was awareded to Shri G. Ramakrishna Rao; the Best Management Term Paper A.K. Chatterjee Silver Medal was awarded to Dr. Vaibhav C. Mathur; the Top Trainee in Wildlife Biology (book prize) was awarded to Dr. Vaibhav C. Mathur; and the Silver Medal for the Best Foreign Trainee was awarded to Shri Ganesh Pant.

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XXXII Advanced Postgraduate Diploma in Wildlife Management

The 10-month Advanced Postgraduate Diploma Course commenced on September 1, 2010. This is the first diploma course with the increased duration of 10 months (from the earlier duration of 9 months). A total of 20 officer trainees of Assistant Conservator of Forests/Deputy Conservator of Forests rank and equivalent undertook the course. Among them, 19 officers represented 13 Indian States (one each from Himachal Pradesh, Gujarat, Kerala, Orissa, Punjab, Uttarakhand and West Bengal and two each from Assam, Karnataka, Haryana, Madhya Pradesh, Maharashtra and Rajasthan). One foreign national from Nepal, sponsored by the Global Tiger Forum (GTF), also participated. This is the first diploma course in which seven IFS probationers have joined directly after completing their training at the Indira Gandhi National Forest Academy, Dehra Dun as 'Hari Singh Fellows'.

The officer trainees were taken to a bird-watching trip around the WII campus on September 4, 2010. This was followed by a visit to Rajaji National Park on September 18, 2010 to study issues related to trekking, orientation, the study of animal behaviour and familiarization with the vegetation of the Shivaliks. The orientation tour took place during September 25-30, 2010 at Chilla in Rajaji National Park. It familiarized the officer trainees to the Shiwalik landscape and issues related to corridor management, the people-park interface, *Gujjar* relocation and mass tourism.

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The participants of the course were taken for the High Altitude Ecology Tour during October 22-28, 2010. They visited Kedarnath Wildlife Sanctuary and Nanda Devi Biosphere Reserve and trekked from Chopta to Tungnath (3680 m above msl). The Techniques Tour was conducted at Sariska Tiger Reserve during December 5-24, 2010. The officer trainees got firsthand exposure to the latest in camera traps and radio-telemetry. They also learnt various techniques such as the use of line transects, vehicle based transects, block counts, pellet counts, bird counts and habitat mapping. The trainees also made a short visit to Keoladeo National Park, Bharatpur. The tour was completed with live demonstrations of animal restraint techniques. The tour was followed by extensive data analysis sessions at the Institute to make the officer trainees fully conversant with the techniques.

As part of the Management Tour (Indian component) the officer trainees were taken to several wetland areas, wildlife sanctuaries and zoological parks in Orissa, West Bengal and Assam from February 11, 2011 to March 6, 2011. The objective of the tour was to study the range of wildlife management strategies being practiced by the park managers and to assess their relative strengths and weaknesses. The second part of the Management Tour (foreign component) was conducted in several protected areas in Kenya during March 13-22, 2011. The purpose of the visit was to get a regional perspective and study a wide range of wildlife and protected area management practices. Besides briefings and discussions on wildlife conservation issues, there were lectures and interactions with wildlife officials of Kenya. The officer trainees visited Langata Giraffe Centre at Nairobi - Conservation Center; Nairobi National Park; Tsavo East National Park; Aberdare National Park; Lake Nakuru National Park; Lake Naivasha; and Masai Mara Game Reserve.

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XXVI Certificate Course in Wildlife Management

The course commenced on November 1, 2010 and came to an end on January 31, 2011. Nineteen officer trainees of the rank of Range Forest Officer and equivalent joined the course. Among them, 15 officer trainees represented different states within the country, with one each from the Andaman and Nicobar Islands, Kerala, Orissa, Jharkhand, West Bengal, Nagaland, Manipur, Sikkim and Himachal Pradesh and three from Maharashtra and three veterinary doctors from Madhya Pradesh. In addition, there were four foreign nationals from neighbouring Asian countries (one each from Bangladesh, Nepal, Bhutan and Vietnam), sponsored by the Global Tiger Forum, New Delhi.

The officer trainees undertook the Orientation-cum-Techniques Tour at Rajaji National Park (Uttarakhand) from November 22, 2010 to December 3, 2010. The objective of this tour was to familiarize trainees with different wildlife techniques. The Management Tour was conducted during January 3-21, 2011 at Corbett National Park in Uttarakhand and various parts of Gujarat. In Gujarat, the officer trainees visited the GEER Foundation, Nalsarovar Bird Sanctuary, Gulf of Kutch Marine National Park, Sakkarbagh Zoo, Gir National Park and 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. Apart from the Technique and Management tour, trainees were also taken to Asan Conservation Reserve and Jhil Mil Jheel Conservation Reserve in Uttarakhand for a better understanding of community participation in wildlife conservation.

The valedictory function was organized on January 31, 2011. Dr. S.S. Negi, Director, Forest Research Institute, was the chief guest on the occasion. He presented the certificates and various awards to the officer trainees. Twelve out of 19 officer trainees received the Honours Certificate. In addition, the following awards were also given away to the following officer trainees for their outstanding performance:

The Wildlife Conservation Gold Medal for the Top Trainee was bagged by Dr. Guru Dutt Sharma from Madhya Pradesh. The Institute's Silver Medal for the Best All Round Wildlifer was awarded to Shri Ramachandra from the Andaman and Nicobar Islands. The Institute's Silver Medal for the 'Best Performance in Wildlife Management Module' was given to Shri Devender Singh Chauhan from Himachal; and Mr. Bal Krishna Koirala from Bhutan received the Institute Silver Medal for the 'Best Foreign Trainee'.

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Other Training Courses

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Training workshop on biodiversity data discovery and publishing, Dehra Dun, *May 4-7, 2010*.

The Global Biodiversity Information Facility (GBIF) was established in March 2001, as an open ended international coordinating body, to promote the compilation, linking, standardization, digitization and dissemination of the world's biodiversity data in the form of a distributed open access system, within an appropriate framework for property rights with due attribution. The Wildlife Institute of India has been designated as the coordinating agency for GBIF activities in India. The workshop was the first of the series of workshops to be held in collaboration with GBIF.

The objectives of the workshop were to :

(i) Develop an institutional data discovery and mobilisation strategy.

(ii) To digitise primary biodiversity data (initiation, tools and standards, data quality enhancement including geo-referencing, etc.).

(iii) To develop a pool of trainers/experts for

(a) Handling social, political and intellectual property barriers in biodiversity data discovery and publishing.

(b) Discovering biodiversity data through enriched metadata document authoring.

(c) Publishing biodiversity data through installations of GBIF IPT.

The workshop was jointly organised by the Wildlife Institute of India, Dehra Dun and the Global Biodiversity Information Facility, Copenhagen, Denmark. In all, 32 participants attended the workshop.

GBIF-Asian nodes regional meeting and biodiversity informatics workshop, Dehra Dun, *June 28-30, 2010*.

The Global Biodiversity Information Facility Secretariat (GBIFs) in collaboration with the Wildlife Institute (WII) of India organized the regional meeting and biodiversity informatics workshop. The meeting was chaired by Mr. Pando Francisco (GBIF NODES Chair). Representatives from University of Tokyo, Japan; Korea Institute of Science and Technology Information, South Korea; Wildlife Institute of India, India; Asian Centre for Biodiversity, Philippines; Biodiversity Research Center, Chinese Taipei; ICIMOD, Nepal; and BioNet EASIANET,

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Mongolia participated in the meeting. The GBIF secretariat was represented by Mr. Juan Bello and Dr. Vishwas Chavan.

The objectives of the workshop were :

(i) Regional priorities and targets for biodiversity informatics in Asia.

(ii) Requirements/opportunities for the implementation of the Regional Action Plan.

(iii) Mechanisms to improve the regional coordination, communication, collaboration, and participation in the Asian region.

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One-week compulsory training course for IFS officers on 'Illegal trade in wildlife and its protection strategies: Intelligence gathering, anti-poaching strategies and role of wildlife forensics in dealing with wildlife crime', Dehra Dun, *October 11-15, 2010.*

The objective of the training was to understand the extent of the illegal trade in wildlife in India, target species and their status, conservation efforts being made to deal with the issue, including adopting anti-poaching strategies by the department and related enforcing agencies, the role of TRAFFIC, CITES and the intelligence gathering role of wildlife forensics in dealing with wildlife crimes in the country.

The workshop was sponsored by the Ministry of Environment and Forests, Government of India, New Delhi and was organized by the Wildlife Institute of India, Dehra Dun. In all, 23 participants attended the course. Apart from the in-house sessions, chaired by eminent faculty, a field visit to Rajaji National Park for a day was also conducted.

Training workshop on 'Role of scientists in biodiversity conservation', Dehra Dun, *October 25-29, 2010.*

This training was organized as a part of the Department of Science and Technology (DST) scheme 'National Training Programme for Scientists & Technologists working in Government Sector'. Under this scheme, the DST has initiated training programmes exclusively for women scientists/ technologists. The scheme has proved to be a very popular and meaningful initiative towards capacity building and empowering scientists and technologists in a holistic manner.

The key objectives of the workshop were to make the scientists aware of :

(i) The principles/approaches in biodiversity conservation.

(ii) The causes of declines in natural resources/ habitats and species.

(iii) Good practices in biodiversity conservation.

(iv) Conservation issues in the field and to establish linkages and facilitate sharing of information among scientists.

Twenty-three women scientists from all over the country participated in the workshop. Prominent resources persons from the Institute and outside were invited to deliver lectures and deliberate upon the various aspects of wildlife conservation. Apart from theoretical sessions, case studies from different parts of the country covering various aspects of wildlife conservation were also presented. Field visits to nearby protected areas were organized to sensitize the participants to the field techniques related to wildlife science, including camera trapping, the use of GPS and radio-tracking

National level training programme for scientists and technologists in 'Biodiversity Conservation', Dehra Dun, *November 8-13, 2010.*

The objectives of the training programme were to:

(i) Make scientists fully aware of the principles/ approaches in biodiversity conservation.

(ii) Make them aware of the causes of declines in natural resources/habitats and species.

(iii) Make them aware of good practices in biodiversity conservation.

(iv) Establish linkages and facilitate sharing of information among scientists.

(v) Reiterate the role of scientists in the creation of baseline information and database management.

The training programme was conducted by the Wildlife Institute of India for 13 participants working in government departments, other institutions and universities. The science involved in biodiversity

conservation and management has developed manifold in recent years. One of the reasons for the rapid transformation of this field is the influence of technology. It is important that the scientists involved in biodiversity conservation be exposed to innovative applications. This course catered to this need, and in 1 week, 21 lectures and field visits were conducted.

National training workshop on 'Strengthening CITES implementation capacity to ensure sustainable wildlife management and non-detrimental trade' in India, Dehra Dun, *December 20-21, 2010*.

The training workshop was held at the Institute in collaboration with the CITES Secretariat, Geneva and the Ministry of Environment and Forests, Government of India. Various enforcement agencies such as forest and wildlife managers, officials from the customs, and scientists from various institutions, including NGOs, participated in the workshop. About 25 participants and resource persons attended this workshop.

The workshop assisted officials and scientists in fulfilling more effectively the obligations under CITES and helped ensure sustainable management of natural resources through a well regulated trade in species of conservation concern. The participants gained a basic understanding of the obligations under the convention and its procedures. The workshop also offered an introduction to non-detriment findings (NDF) and identification of species listed in the various appendices of CITES.

Training workshop for the field staff of Corbett Tiger Reserve and Guards' Training School at Kalagarh, *December 27-29, 2010*.

The objectives of the workshop were to impart training in physical restraint techniques and monkey capture and relocation procedures and on the use and construction of power fences for controlling the movement of wild animals. The workshop was organised by Corbett Tiger Reserve, Uttarakhand Forest Department. More than 60 participants attended the workshop.

Attachment of probationers of Indian Revenue Service (Customs & Central Excise) Group - A (61st Batch), Dehra Dun, *January 17-28, 2011 and February 1-12, 2011*.

This special training course in wildlife protection, law and forensic science was conducted for the probationers of the Indian Revenue Service (Customs & Central Excise) Group-A, 61st Batch. It was basically aimed at sensitizing the young officers towards the wildlife trade in the country and their role in checking it. The course was conducted in two groups, and a total of 158 probationers attended the course.

Inputs on the importance of biodiversity and its conservation, status and monitoring of endangered species including flagship species such as the tiger, illegal trade in wildlife articles including butterflies, shahtoosh, rhino horn, skins and tiger bones, importance of plant taxonomy and trade in medicinal plants were provided. Special inputs were given on the role of wildlife forensics in dealing with wildlife cases. The probationers were also given basic information on the implementation of the Wildlife Protection Act, 1972 and the provisions of CITES and the role of TRAFFIC.

A field visit was also arranged to Corbett Tiger Reserve to sensitize the probationers to the needs and the difficulties of the field. The probationers had a very fruitful interaction with the Field Director and Deputy Director of Corbett Tiger Reserve.

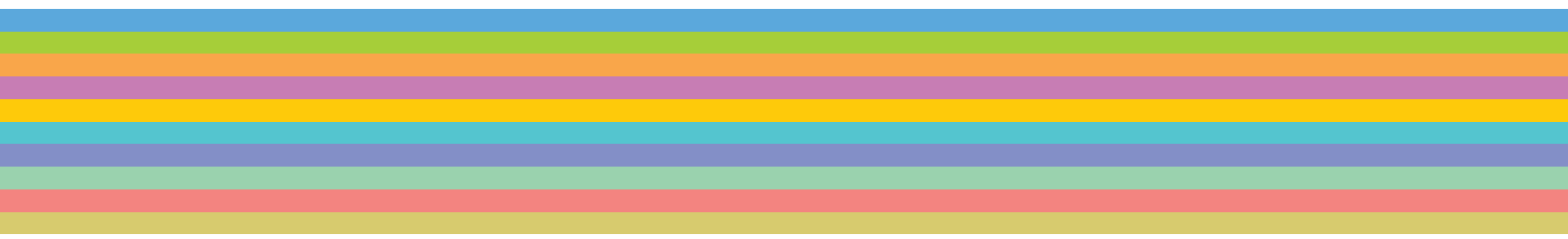
Training module on 'Wildlife and Biodiversity Conservation', Dehra Dun, *February 16-26, 2011*.

The Wildlife Institute of India conducted this training module for officers of the Indian Forest Service as part of their Mid-Career Training (MCT) Programme at the Indira Gandhi National Forest Academy, Dehra Dun. Fifty eight-officers having 2001, 2002, 2003 and 2004 as their Year of Allotment in the IFS participated in the programme.

The module started with a visit to Corbett Tiger Reserve, where some of the participants could witness a pair of Himalayan yellow throated martens hunting a chital fawn. The participants had a very fruitful interaction with the officers and staff of the tiger reserve to get an insight into the problems and issues of the tiger reserve. The participants had interactive sessions with senior faculty members of the Institute and guest experts from Wildlife Crime Control Bureau, TRAFFIC-India and serving wildlife managers from the field.

Training workshop for the field staff of Haryana Forest Department, Sultanpur Wildlife Sanctuary, *March 9-10, 2011*.

Capacity building of field staff, mitigation of the wild animals-human conflict with special reference to the leopard and monkey problems, and providing training in the use of physical and chemical restraint techniques were the objectives of the workshop. It was organized by the Haryana Forest Department. A total of 70 participants attended the workshop.



CAPACITY BUILDING

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- WORKSHOPS, SEMINARS & CONFERENCES ORGANISED
- PARTICIPATED

Capacity Building and Professional Exchange

Organised By WII

Three days training cum sensitization programme in wildlife protection, law and forensic for judicial officers of Delhi Judicial Academy, Dehra Dun, *April 1-3, 2010.*

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The objectives of the training programme were to :

(I) Sensitize the participants about the unique biodiversity of India, its importance and the challenges of conservation.

(ii) Generate an understanding about the illegal trade of wildlife and wildlife products and legal instruments available in India to control this illegal trade.

(iii) Provide a basic understanding about the use of wildlife forensic science for wildlife law enforcement in India.

The training programme was organized by the Wildlife Institute of India and sponsored by the Delhi Judicial Academy, Government of India. In all, 81 officers participated in the training programme. The officers were also taken for a field visit.

Workshop on wildlife telemetry, Dehra Dun, *April 24-25, 2010.*

The workshop was conducted at the Institute. In total, 150 delegates attended the workshop. Mr. Stan Tomkiewicz, Director, Environmental Programs, TELONICS, Inc., USA, was the resource person who delivered lectures during the workshop. In total, there were 21 presentations made by various speakers in five technical sessions, viz. VHF Tracking of Wild Animals-Ungulates and Mega-herbivores, VHF Tracking of Wild Animals-Reptiles, VHF Tracking of Wild Animals-Carnivores, GPS/Satellite Tracking-Wild Animals/Birds and New Technologies and the Future Development. It was decided that the outcome of the presentations made during the workshop would be brought out by the Institute as an ENVIS Bulletin on 'Application of Telemetry in Wildlife Conservation'.

30th annual symposium on 'sea turtle biology and conservation', Goa, *April 24-30, 2010.*

It was for the first time that the symposium was held in the South Asian region. Nearly 400 people from across the globe attended the symposium. The Wildlife Institute of India had a major presence at the symposium, and a stall was put up, where the Institute's two decades of sea turtle research was displayed. Shri B.C. Choudhury gave the introductory talk at the South Asia Mini Symposium. During the course of the symposium, five oral and three poster presentations on WII's sea turtle research activities dealing with different aspects were made.

Second meeting of the GBIF India nodes, Dehra Dun, *May 3, 2010.*

The Second meeting of the Indian Nodes of the Global Biodiversity Information Facility (GBIF) was held in the Institute under the chairmanship of Shri A.K. Goyal, Joint Secretary, MoEF. Thirteen participants from seven organizations participated in the meeting. The chairman announced that the MoEF has designated five nodes for dealing with all matters relating to the development of bioinformatics in India. Dr. V.B. Mathur stated that data management is a mandate of every organization.

A collaborative workshop on 'International Biodiversity Day', Munsiyari, *May 22, 2010.*

International Biodiversity Day was jointly organised by NASI-UA chapter, Wildlife Institute of India, Dehra Dun and Mountain Action Research Group (MARG),

Nainital at Government Inter College, Munsiyari. The students were educated through slide shows on various topics such as the biodiversity of Uttarakhand state, medicinal plants and their uses and the role of sacred groves in biodiversity. They were also taken to the vicinity of the college to learn about the plants and their economic and medicinal values.

Consultative meeting for Nanda Devi-Askot Landscape biodiversity conservation and livelihood security for local community, Dehra Dun, *June 2, 2010.*

The meeting was jointly organised by the Wildlife Institute of India and Kalpavriksh.

The objectives of the consultative meeting were to :

(I) Understand the conservation importance of the Nanda Devi-Askot Landscape.

(ii) Discuss the issues concerning the conservation of natural resources and livelihood security of the local people in the region.

(iii) Decide on various steps required for development of an integrated strategy for long-term conservation of this landscape by involving different stakeholders and communities and coordinating them better.

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The consultative meeting was organized as a part of a series of dialogues. In this meeting, representatives of major stakeholders in this landscape participated. After brief introductory presentations on Nanda Devi Biosphere Reserve and Askot Wildlife Sanctuary, the participants discussed major issues concerning the long-term conservation of this landscape. They also discussed issues related to the livelihoods of local communities and ongoing/proposed developmental projects. The participants also brought in their experiences of working in this region through Van Panchayat, Joint Forest Management Programme and other initiatives of NGOs. Finally, the participants worked out the future strategy of this initiative. It was decided that in continuation of this initial dialogue, three regional consultative meetings would be organized in the coming months in this landscape.

Training of Trainers Course for Tiger Conservation, Smithsonian Conservation Research Centre, Virginia, USA, *June 5-19, 2010.*

As part of the World Bank's Global Tiger Initiative, the Smithsonian Conservation Research Centre (SCRC), USA and the Wildlife Institute of India (WII) jointly organized the 'Training of Trainers Course for Tiger Conservation' to build the capacity of participants from the tiger range countries. In Part I of this training course, the participants were given hands-on training in various facets of tiger conservation by the scientists of SCRC and WII and other resource persons from February 18 to March 26, 2010 at WII, Pench and Kanha Tiger Reserve.

Part II of this training course was organized by the SCRC in Front Royal, Virginia, USA from June 1 to 15, 2010, and Dr. V.B. Mathur, Dean and Dr. Y.V. Jhala were invited to provide professional inputs.

Training workshop for the officers and field staff of the Kota Forest Division, Ranthambore Tiger Reserve, *June 18, 2010.*

Capacity building of forest officials and field staff and providing training in capturing carnivores using snares with special reference to the tiger were the objectives of the workshop. The workshop was sponsored by Ranthambore Tiger Reserve, Rajasthan Forest Department. More than 30 participants attended the workshop.

National consultation workshop for 'identification of research gaps in coastal and marine biodiversity conservation in India', Chennai, *June 24-25, 2010.*

The Wildlife Institute of India, in association with the

Ministry of Environment and Forests, Government of India, organized the workshop at Chennai. The main objective of this two-day 'national consultation workshop' was to identify the gap areas in research so that steps could be initiated to conduct important research programmes on a priority basis, which would strengthen the conservation and management of coastal and marine biodiversity in the country.

The specific objectives of the workshop were:

(i) Identification of research gaps in coastal and marine biodiversity.

(ii) Prioritization of research activities.

(iii) Identifying institutions to plug research gaps.

A total of 40 delegates including scientists, field managers and researchers from various organizations participated in the workshop. Leading professionals from various organizations reviewed the work done in different aspects of coastal and marine biodiversity research.

VI Internal Annual Research Seminar (IARS), *September 13-14, 2010* **and XXIV Annual Research Seminar (ARS) of WII, Dehra Dun,** *September 15-16, 2010.*

The VI Internal Annual Research Seminar (IARS) was chaired by Shri V.B. Sawarkar, Chairman, Training, Research and Academic Council (TRAC). During the IARS, a total of 22 presentations were made in five sessions, viz. Vegetation Ecology, Community Ecology, Species Distribution and Habitat Use, Abundance Estimation and Monitoring, and Human-Wildlife Interface. The presentations were based on recently initiated and ongoing research studies and were made by research fellows and faculty members of the Institute. The presentations were evaluated by a panel of judges. Five presentations were adjudged as the best presentations, and the concerned research personnel were awarded book prizes, each worth Rs.1500/-.

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Book Awards for Best Presentations

VI Annual Internal Research Seminar

Rank	***First***
Name	S. Harikrishnan
Topic of Presentation	Survey of herpetofaunal diversity in the Andaman and Nicobar Islands

Rank	***Second***
Name	Salvador Lyngdoh
Topic of Presentation	Socio-economic and wildlife conflict status in western Arunachal Pradesh with special reference to Asiatic wild dog: preliminary findings

Rank	***Third***
Name	Shazia Quasin
Topic of Presentation	Pattern of spider assemblages along altitudinal gradient in Nanda Devi Biosphere Reserve, Uttarakhand

Rank	***Four***
Name	Krishnendu Mondal
Topic of Presentation	Ranging pattern and survivorship of leopard in semi -arid landscape of Sariska Tiger Reserve, Rajasthan

Rank	***Five***
Name	Dipanjan Naha
Topic of Presentation	Population estimation and ranging pattern of tiger in Sundarban Tiger Reserve, West Bengal

The XXIV Annual Research Seminar of the Institute was also chaired by Shri V.B. Sawarkar, Chairman, TRAC.

The following publications were released at the inaugural session of the ARS :

(I) ENVIS Bulletin on Freshwater Turtles and Tortoises of India.

(ii) Power Fence Manual.

(iii) Amphibians and Reptiles of Uttarakhand.

A total of 23, presentations were made in six technical sessions, viz. Animal Ecology : Mammals, Vegetation Ecology, Human-Wildlife Interface, Tools and Techniques, Conservation Genetics and Captive Management. These included studies on large and small carnivores, avifaunal studies, molecular genetics and forensic studies, studies on coastal and marine biodiversity, herpetofauna and small mammals. The presentations were based on the ongoing research studies and were made by research fellows and faculty members of the Institute.

About 300 delegates/participants attended the ARS. A panel including eminent scientists, academicians, conservationists and wildlife managers evaluated the relevance and quality of research of the presentations. The presentations made by the following researchers on the topics

cited were adjudged the best five presentations made during the XXIV Annual Research Seminar. All five researchers were given book awards, each worth Rs.1500/-.

Book Awards for Best Presentations

XXIV Annual Research Seminar

Rank	***First***
Name	Abishek Harihar
Topic of Presentation	Population viability of tigers in their north-western range limit, Terai-Arc Landscape
Rank	***Second***
Name	Mousumi Ghosh
Topic of Presentation	Comparison of prey availability and altitudinal distribution of breeding leaf warblers in the eastern and western Himalaya
Rank	***Third***
Name	Merwyn Fernandes
Topic of Presentation	Distribution and genetic diversity of Red Junglefowl in India
Rank	***Four***
Name	Sutirtha Dutta
Topic of Presentation	Population monitoring, habitat relationships and conservation of endangered bustards
Rank	***Five***
Name	K.R. Saravanan
Topic of Presentation	Prioritization of important coastal and marine biodiversity areas along the coastline of India

In the concluding session, comments on the ARS were made by senior officials, policy makers, conservationists, members of the Governing Body-WII and the Chairman, TRAC. The significant enhancement in quality of the presentations in terms of visuals, graphics and scientific content was appreciated.

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A photography competition was also held during the ARS, and the winners were awarded book prizes.

Training programme on 'Human Dimensions in Wildlife Management in India', Kanha Tiger Reserve, Madhya Pradesh, *September 27-October 1, 2010.*

The objectives of the training programme were :

(i) To present to conference attendees the breadth of current projects in human dimensions of fish and wildlife research and management.

(ii) To provide specific examples or approaches to integrating human dimensions into fish and wildlife management as related to the conference themes. It was organized and sponsored by the Wildlife Institute of India and Colorado State University, USA.

This training programme was essentially to expose the participants from Colorado State University, USA and protected area managers of India to various issues involved in the management of human dimensions in PA management. The workshop provided an opportunity to expose the participants to different approaches in dealing with the human issues in protected area management in USA and India. The training comprised lecture sessions, panel discussions and field visits.

Regional media workshop on 'Wildlife Conservation Issues', Bhubaneswar, *December 7-8, 2010.*

The Wildlife Institute of India organized a two-day workshop for media personnel at New Delhi in December, 2009 which was inaugurated by the Hon'ble Minister for Environment and Forests and inter alia attended by several members of the Institute's Governing Body. The Governing Body has approved two regional workshops for media personnel. Accordingly, the first regional workshop was organized by the Wildlife Institute of India for media personnel at Bhubaneswar.

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The main objective of the workshop was to sensitize the media personnel on wildlife conservation to facilitate better understanding of various issues on

the subject. The workshop enabled the participants to articulate the wildlife related issues to people in a manner which contributes to the cause of wildlife conservation in the country. Shri P.N. Padhi, Principal Chief Conservator of Forests (WL) and Chief Wildlife Warden, Government of Orissa was the chief guest of the workshop. Shri Padhi addressed the participants on the issues related to the Forest Right Act. A total of 23 participants attended the workshop. Dr. A.K. Jha, Commissioner, Tribal Research and Training Institute; Shri Biswajit Mohanty, Member, WII-Governing Body; and Ms. Prerna Singh Bindra, wildlife journalist also provided their valuable inputs, apart from senior faculty members of the Institute.

Stakeholders Workshop for Management Planning of Okhla Wildlife Sanctuary, Noida, *December 8-12, 2010.*

The workshop was organized and sponsored by the Wildlife Institute of India and Uttar Pradesh Forest Department. A total of 20 participants attended the workshop. This one-day workshop was organized as part of a management planning exercise given to the Wildlife Institute of India by the UP Forest Department. The workshop was attended by selected GOs, NGOs and community representatives of the area. The workshop tried to capture various issues and perceptions of stakeholders which could be addressed in the management plan for the PA.

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, 2010.*

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) Impart an understanding of the gravity of the issues related to the illegal trade in wildlife and wildlife products, the legal instruments available to control this trade and the role of customs officers.

(iii) Provide basic skills of forensic science for identification of important wildlife products in trade.

(iv) Generate discussions and share the experiences of field officers dealing with issues of trade at international borders.

The training programme was organised by the Wildlife Institute of India and sponsored by the National Academy of Customs, Central Excise and Narcotics, Faridabad, Haryana. In all, 62 officers participated in the training programme. Apart from classroom sessions, field visits and panel discussions were also organized for the participants.

Training workshop on 'Strengthening CITES Implementation Capacity to Ensure Sustainable Wildlife Management and Non-detrimental Trade in India', Dehra Dun, *December 20-21, 2010.*

This training workshop was jointly organized by the Wildlife Institute of India and the Wildlife Division of the Ministry of Environment and Forests (MoEF), Government of India. This workshop was sponsored by the CITES Secretariat, Geneva.

The workshop was conducted with the following objectives :

(i) Strengthening CITES' implementation capacity to ensure sustainable wildlife management and non-detrimental findings in India.

(ii) Providing an orientation towards identification of the Indian faunal and floral species listed in CITES appendices.

The workshop benefited from the resource persons involved in the previous workshop of CITES, which was held in Makati City in 2010 and from the experienced faculty of the Wildlife Institute of India. About 25 participants and resource persons attended this workshop. Leading experts in the fields of wildlife forensic science, taxonomy and trade were invited to this workshop as resource persons. Leading experts from various research organizations, NGOs and the MoEF were invited as participants, who will probably making NDF for the Appendix II species of CITES on behalf of the Government of India.

Capacity building workshop on 'Management of Wild Animals in Distress', Gauchar, *January 6-7, 2011.*

A training workshop was organized for officers, veterinarians and frontline staff working in the Kedarnath Forest Division. The workshop was organized with the objective of sensitizing the participants to various management options and strategies while dealing with man-animal conflict. Emphasis was laid on the ethical, humane and scientific management of wild animals in distress. Besides teaching inputs, hands-on exercises on dart assembly and handling of equipment were carried out.

Workshop on 'Rajbhasha Implementation', Dehra Dun, *February 4, 2011.*

A workshop was organized on rajbhasha implementation at the Institute. The objectives of the workshop were to encourage the participants to use Hindi increasingly in the Institute and to discuss the policy and rules pertaining to the rajbhasha. Dr. M.R. Saklani, Assistant Director; Rajbhasha and Member-Secretary, Nagar Rajbhasha Implementation

Committee, Dehra Dun was invited to deliver a lecture. A total of 55 officers and staff participated in the workshop.

Attended by WII Personnel

Project Elephant Task Force consultation meetings, *April 3-5, 2010,* **Bangalore/Mysore;** *April 17-18, 2010,* **Bhubaneswar;** *April 30, 2010,* **KFRI;** *May 9-10, 2010,* **Delhi.**

Following the Project Elephant Steering Committee meeting held on February 4, 2010, the MoEF constituted a 12 member Task Force on Project Elephant with mandates to evaluate and recommend measures that can enhance the effectiveness of conservation and management of elephants in the wild and in captivity. Dr. Sushant Chowdhury from WII was appointed as a member to the Task Force. The first meeting of the Task Force was held at Delhi on February 24, 2010, followed by a series of consultative meetings covering four major distributional ranges of elephant in the country. The meetings were held successively to discuss issues related to the matter of governance, conservation and management of elephants with state governments, field personnel, NGOs and other stakeholders. The north-east India consultative meeting could not be attended by Dr. Sushant Chowdhury. These consultations, with incorporated members' inputs, then culminated in a report titled 'Gajah', which was submitted to the MoEF on August 31, 2010.

Wildlife telemetry workshop, Dehra Dun, *April 24-25, 2010.*

Dr. Bilal Habib attended the workshop. He made two presentations during the workshop :

(I) 'Tracking the Life of Tricarinate Hill Turtle (*Melanochelys Tricarinata*) within WII Campus'.

(ii) 'An Overview of Telemetry Study on Wolves in Semi-wild Landscapes of Deccan, Maharashtra, India. Shri R. Suresh Kumar was one of the co-presenters of "Tracking the Life of Tricarinate Hill Turtle *Melanochelys Tricarinata* within WII Campus" along with Dr. Bilal Habib and Dr. Gautam Talukdar.

14th meeting of the subsidiary body on 'Scientific, Technical and Technological Advice' (SBSTTA), Nairobi, Kenya, *May 10-21, 2010.*

The Ministry of Environment and Forests, Government of India designated Dr. V.B. Mathur, Dean as a member of the Indian delegation for the 14th meeting of the Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA).

Dr. Mathur specifically provided technical inputs on two agenda items :

(i) SBSTTA UNEP/CBD/SBSTTA/14/5 Item No. 3.1.4 (Protected Areas).

(ii) SBSTTA UNEP/CBD/SBSTTA/14/14 Item No. 4.3 (Forest Biodiversity).

***Ex situ* conservation programme for hoolock gibbon in Arunachal Pradesh,** *May 11-15, 2010.*

Shri R. Suresh Kumar provided technical inputs to the Arunachal Pradesh State Forest Department for a proposed ex situ conservation programme.

Translocation of a few eastern hoolock gibbons stranded near Delo Village, located between Roing and Mehao Wildlife Sanctuary, was attempted by the Arunachal Pradesh State Forest Department and was not successful. Technical support was sought from WII for translocation of the stranded gibbons.

Training for capacity enhancement of Uttar Pradesh Forest Department officials and ground staff for undertaking elephant estimation, *May 13, 2010.*

A one-day training workshop was organized for enhancing the capabilities of officers and field staff of the U.P. Forest Department to undertake elephant estimation, following the guidelines outlined and circulated by the Ministry of Environment and Forests (MoEF), GoI. The workshop was organized at Jafrabad, Forest Rest House, Najibabad, where over 40 participants including officers and field staff from Shivalik Forest Division, Social Forestry Division, Bijnore and Bijnore Forest Division, Njibabad were present. Dr. Sushant Chowdhury from WII explained the total count and sample block count methods as prescribed by the MoEF, GoI. Methods used for habitat stratification, ageing and sexing, and identification of individuals and herd members were also explained to the participants. Procedures for double count eliminations and analysis of information were also part of the deliberations and discussion. Dr. Parag Nigam from WII and Dr. Anil Kumar Singh from WTI also interacted with the participants and shared their experiences.

9th international conference on 'Bear Research and Management', Georgia, *May 16-22, 2010.*

Dr. S. Sathyakumar participated in this international conference. He made one oral and three poster

presentations that were based on results from WII's ongoing research projects on bears.

World heritage global training strategy meeting, Rome, *May 20-21, 2010*.

Dr. V.B. Mathur, Dean was invited to participate in the consultative meeting organized by the International Union of Conservation of Nature (IUCN) and the International Centre for the Study of the Preservation and Restoration of Cultural Property (ICCROM) for developing a 'training and capacity development strategy for world heritage'.

UNESCO sub-regional workshop on 'The Second Cycle of the Periodic Reporting for West, Central and South Asia, Dehra Dun, *June 1-5, 2010*.

The objectives of the workshop were :

(i) To present and explain to the National Focal Points, the process and new format of the Periodic Report.

(ii) To mobilize active participation of States Parties for the periodic reporting exercise in training of site managers at national and/or sub-regional levels.

(iii) To provide guidance to the States Parties on drafting Statements of Outstanding Universal Value for properties inscribed on the World Heritage List in the region.

(iv) To promote regional cooperation through exchange of information and experience in the implementation of the World Heritage Convention.

The workshop was organised by the UNESCO World Heritage Centre, in cooperation with Indian National Commission for UNESCO, Archaeological Survey of India (ASI), Wildlife Institute of India and the relevant field offices of UNESCO.

This sub-regional training workshop on the Second Cycle of the Periodic Reporting in Asia and the Pacific in Dehra Dun, India was launched by this exercise for central, West, and South Asian countries. Periodic reporting is a process whereby States Parties report on the status of the implementation of the World Heritage Convention in their respective territories and the state of

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conservation of properties inscribed in the World Heritage List. The workshop gathered national Focal Points of the 14 States Parties from central, West and South Asia (Afghanistan, Bangladesh, Bhutan, India, Iran, Kazakhstan, Kyrgyzstan, Maldives, Nepal, Pakistan, Sri Lanka, Tajikistan, Turkmenistan and Uzbekistan), international resource persons, advisory bodies (ICOMOS, IUCN and ICCROM), staff from eight UNESCO field offices and the UNESCO World Heritage Centre, and it involved introductory presentations, drafting exercises, group discussions and presentations. Dr. K. Sivakumar attended the sub-regional workshop from the Institute.

International conference on wildlife and biodiversity conservation *vis-à-vis* climate change, Srinagar, J&K *June 3-5, 2010*.

Dr. Bilal Habib participated in this international conference. He presented a paper on 'Predation dynamics of wolves in semi-wild landscapes of Deccan Plateau, Maharashtra, India'.

Consultative meeting with local inhabitants and government authorities of Kailash Sacred Landscape Conservation Initiative at Government Degree College, Narayan Nagar, *June 12, 2010.*

Dr. B.S. Adhikari attended the meeting, which was organized by G.B. Pant Institute of Himalayan Environment and Development, Kosi-Katarmal, Almora.

Regional workshop and training on 'Open Access and Publication of Mountain Biodiversity Data of the Hindu Kush Himalayan Region', Kathmandu, Nepal, *June 12-19, 2010*.

The workshop and training were co-organized by International Centre for Integrated Mountain Development (ICIMOD), Global Biodiversity Information Facility (GBIF) and Global Mountain Biodiversity Assessment (GMBA) ICIMOD, Kathmandu, Nepal. The objectives of the workshop were to bring the eight regional member countries (RMCs) to discuss the opportunity that the GBIF infrastructure and framework represents for primary biodiversity data discovery, publishing and use for the Hindu Kush Himalayan (HKH) countries and the region and to strengthen the capacity of biodiversity

researchers and data publishers from the HKH region to discover, digitize and publish biodiversity data by adopting GBIF promoted tools, standards and processes. The workshop discussed the critical issue of developing a framework and partnership, needed for continuous promotion of easy and open access to standardized and harmonized biodiversity information in the HKH region. Dr. Gautam attended the workshop as a participant and a resource person. He gave a talk on 'Biodiversity Informatics with Reference to Indian Context'.

Training programme on management and leadership development, Mussoorie, *June 14-18, 2010*.

Dr. J.A. Johnson attended the training workshop, which was organized by the Lal Bahadur Shastri National Academy of Administration, Mussoorie.

Training workshop on 'Strengthening CITES Implementation Capacity to Ensure Sustainable Wildlife Management and Non-Detrimental Trade', Makati City, Philippines, *June 15-17, 2010.*

The main objective of the workshop was to assist officials and scientists in fulfilling more effectively under CITES (the Convention on International Trade in Endangered Species of Wild Fauna and Flora). The workshop was jointly organized by the CITES Secretariat and the Protected Areas and Wildlife Bureau, Philippines.

A non-detriment finding by a scientific authority is required before an export permit or a certificate of introduction from the sea may be granted for a specimen of an Appendix-I species or an Appendix-II species. A non-detriment finding on the purpose of import must be made by the scientific authority of the State of Import for the import of Appendix-I listed species. More than 40 participants from 14 countries participated in this workshop. The participants included enforcement officials, decision makers and scientists. The Indian delegation actively participated in all the activities of the workshop. Dr. K. Sivakumar attended the training workshop from the Institute.

Short course on 'An overview of landscape genetic approaches for conservation biologists', Edmonton, Canada, *July 2, 2010*.

Shri Sudhanshu Mishra, Senior Research Fellow participated in this short course, which was held at the University of Alberta.

Workshop on 'Control of Blue Bulls', Patna, *July 14, 2010.*

Because of the severe agriculture damage and increasing conflict faced by farmers, Bihar Agricultural Management and Extension Training Institute (BAMETI), on behalf of the Department of Agriculture, Government of Bihar organized this workshop to find ways and means of controlling the blue bull population and reducing the increasing conflicts with farmers. The workshop was attended by over 75 participants consisting of forest officials, officials from BAMETI, district agriculture officers, representatives of local and national NGOs and farmers of the affected districts of Bihar. In Bihar, almost all districts are facing a nilgai problem, but the most affected districts are Patna, Bhojpur, Buxar, Aurangabad, Sasaram, Sibni, East Champaran, West Champaran, Baishali, Saran, Muzaffarpur, Begusarai and Madhubani. According to a conservative estimate, nearly 10% of the arable irrigated lands are impacted. The major damage is to crops such as lentils, rice, paddy, corn and vegetables. Dr. Sushant Chowdhury from WII delivered a talk titled 'Blue bull conflicts in human-dominated landscapes: Options for management' which highlighted the current management and legal efforts undertaken by various state government to tackle this problem.

National mission on 'Seabuckthorn', Leh, *July 14, 2010.*

Dr. B.S. Adhikari attended this meeting, which was organized by the Defence Institute of High Altitude Research (DIHAR), Leh. A national consortium was proposed, and emphasis was placed on developing a mission document for the Trans-Himalayan states with the objective of cultivation of an area of 1 million hectares by 2020.

International conference on 'Biodiversity Conservation in Trans-boundary Tropical Forests', Quito, Ecuador, *July 21-24, 2010.*

The Executive Director, International Tropical Timber Organization, Yokohama, Japan invited Dr. V.B. Mathur to participate in this international conference. The main objective of the conference was to identify the best strategies for effective conservation and management of trans-boundary tropical forests for biodiversity conservation, climate change mitigation and adaptation, and livelihood improvement as well as to enhance forest law enforcement and governance (FLEG) in the zone of influence of trans-boundary conservation areas.

The outcomes of the conference were presented to the COP 10 of CBD in October, 2010 at a side-event organized by ITTO in collaboration with relevant partners. Dr. Mathur presented a paper titled

'Identifying and prioritizing Transboundary Protected Areas (TBPAs) for effective biodiversity conservation: The Indian experience'.

GMBA-DIVERSITAS conference on 'Functional Significance of Mountain Biodiversity'. Chandolin, Switzerland, *July 27-30, 2010.*

Dr. V.P. Uniyal participated in this conference and presented a poster titled 'Multidisciplinary research and monitoring in the Great Himalayan National Park Conservation Area: Sustainable livelihoods based approach'. Dr. B.S. Adhikari also participated and presented a poster titled 'Marsh meadows of Indian Trans-Himalaya: Eco-floristics and aspects of conservation'. The conference was organized by GMBA-DIVERSITAS, Chandolin (Valais), Switzerland.

34th session of the World Heritage Committee, Brasilia, Brazil, *July 29-August 3, 2010*.

Dr. V.B. Mathur, Dean was designated as a member of the official Indian delegation. Dr. Mathur provided technical inputs for the agenda items pertaining to:

(a) State of conservation of properties inscribed on the List of World Heritage in Danger.

(b) Progress report on Global Training Strategy including Category 2 centres.

(c) Launching of the second cycle of periodic reporting in Asia and Pacific.

(d) Revision of the operational guidelines of the World Heritage Convention.

Workshop on 'Sensitization of Judicial Officers', Himachal Pradesh Judicial Academy (HPJA), Shimla, *August 21-22, 2010.*

The workshop was organized by the Himachal Pradesh Judicial Academy (HPJA), Shimla. The objective of the workshop was to sensitize judicial officers of Himachal Pradesh to forest and environment concerns. The Hon'ble Chief Justice, High Court, Himachal Pradesh, chaired the concluding session. Shri Vinay Tandon, PCCF, Himachal Pradesh made a presentation providing an overview of the forests, protected areas, wildlife and environment in Himachal Pradesh. Shri Sameer Sinha, TRAFFIC-India made a presentation on wildlife law enforcement and the illegal trade in wildlife, its products and derivatives. Dr. P.K. Mathur gave a presentation titled 'Biodiversity Conservation in India".

Conference and training on 'International Pathways to Success: Integrating Human Dimensions into Fish and Wildlife Management', Colorado State University, USA, *September 27, 2010-October 1, 2010.*

Colorado State University (CSU) organized this conference and training. The main objective of the conference was to provide an opportunity to researchers, community leaders, wildlife/fishery professionals and academics from all around the globe to participate and share their experiences. The Institute organized a technical session on 'People, Wildlife and Protected Areas: International Perspectives on Conflict and Collaborative Conservation' in which Dr. V.B. Mathur, Dr. A.K. Bhardwaj, Dr. Ruchi Badola and Dr. S.A. Hussain presented their papers.

First official signatory state meeting of UNEP/CMS memorandum of understanding for the conservation and management of dugong and its habitats throughout its range states, Abu Dhabi, *October 4-6, 2010.*

The meeting was jointly organized by the UNEP/CMS Secretariat and the Environment Agency of the United Arab Emirates. A two-member of the Indian delegation including Shri A.K. Srivastava, Inspector General of Forests (Wildlife),MoEF and Dr. K. Sivakumar, Scientist-D, Wildlife Institute of India attended the meeting. Signatories have approved a newly developed innovative toolbox designed to mitigate threats to dugongs includes incentives to replace harmful gillnets with alternative fishing gear to reduce bycatches and minimize the mortality rates. India agreed to implement this toolbox after assessing the threat status of the species in India. Important issues in conservation of the dugong were discussed, and action points were suggested for India and for the South Asia sub-region. India agreed to lead the dugong conservation programme in the South Asia sub-region.

International symposium on 'Benefiting from Earth Observation: Bridging the Data Gap for Adaptation to Climate Change in the Hindu Kush-Himalayan Region', Kathmandu, Nepal, *October 4-6, 2010*.

The symposium was attended by 250 participants from 24 countries, with more than 15 delegates from India. The main objective of the symposium was to foster regional and international cooperation to promote the use of and access to earth observation data for improved scientific knowledge and understanding to support adaptation to climate change in the Hindu Kush-Himalayan region. Shri Rajesh Thapa attended this symposium.

Regional workshop on 'SERVIR-Himalaya', Kathmandu, Nepal, *October 7, 2010.*

This workshop was organized to introduce SERVIR-Himalaya to the stakeholders from the Hindu Kush-Himalayan region and engage them in the process of defining the needs for development and effective use of information products, services and applications. It was attended by 40 participants from regional countries and international organizations. Shri Rajesh Thapa attended this workshop.

Science symposium and 17th meeting of the Governing Board (GB17) of the Global Biodiversity Information Facility (GBIF), Suwon City, Gyeonggi Province, South Korea, *October 9-15, 2010.*

In all, 31 countries, seven international organizations and observers participated in this meeting, making the total number of participants 96. In connection with the meeting of the Governing Board, the annual science symposium was conducted with the theme 'Trans-boundary Conservation Areas, Biodiversity Conservation and Peace Parks'. Dr. Gautam Talukdar attended the symposium.

National consultation workshop on 'Chhattisgarh State CAMPA Vision 2020', Raipur, *October 12-13, 2010.*

The Chhattisgarh Forest Department organized a two-day workshop for developing a vision document for integrating and enhancing protection and management of forest and wildlife in the state through the available CAMPA funds. The workshop was inaugurated by the Hon'ble Shri Vikram Usendi, Forest Minister, Government of Chhattisgarh. In the technical session, representatives of nine states gave their perspectives for CAMPA implementation in their respectives States.A draft of Chhattisgarh's vision statement was presented by Dr. A.A. Boaz, APCCF, CAMPA.

There were five group technical sessions in which panel discussions formed the major consultative process for resolving the issues. These technical sessions were on compensatory afforestration and productivity enhancement, wildlife and biodiversity conservation, livelihood and people participation, forest protection and research, and IT and capacity development. The outcomes of the technical sessions were finalized and presented in the plenary session/valedictory session, wherein the Hon'ble Dr. Raman Singh, Chief Minister, Government of Chhattisgarh was the chairman. Dr. Sushant Chowdhury from WII presented views on the wildlife and biodiversity concerns of the State and emphasized the need for landscape management to reduce human-wildlife conflict.

4th International meeting of Terra Madre Foundation, Turin, Italy, *October 21-25, 2010.*

Dr. V.P. Uniyal participated in the meeting as a resource person.

National level workshop on 'Indian Freshwater Turtle and Tortoises Conservation Priority Areas and Initiatives', Lucknow, *October 22-24, 2010*.

Shri B.C. Choudhury, Shri R. Suresh Kumar and Shri V. Deepak from WII participated in the workshop, which was organized by TSA/MCBT/San Diego Zoo Indian Turtle Conservation Program (ITCP), in association with the Uttar Pradesh Forest Department.

Five priority turtle areas in India were identified and discussed at the meeting. These are the Chambal River and Upper Ganges River System (central India), the Terai Region (northern India), the state of Assam (north-eastern India), the Sunderbans of West Bengal and the state of Orissa (eastern India), and the Western Ghats and the states of Tamil Nadu and Andhra Pradesh (southern India). When combined, these five areas support most of India's endangered and charismatic turtles.

3rd Asian lepidoptera conservation symposium and training programme, Coimbatore, *October 25-29, 2010.*

Shri Manish Bhardwaj and Shri Abesh Sanyal attended the 3rd Asian Lepidoptera conservation symposium and training programme, which was organized by the South Asian Invertebrate Specialist Group, IUCN SSC Zoo Outreach Organisation, Coimbatore. The objective of the conference was to create general awareness among people towards the Lepidoptera (butterflies and moths) and to promote conservation in Asia. Presentations were made on the distribution and conservation of Lepidoptera in the Western Himalayan Landscape.

Workshop on 'The Kanha Grasslands', Kanha Tiger Reserve (KTR), Mandla, *October 25-26, 2010*.

This workshop was sponsored by the wildlife wing of the State Forest Department, Government of Madhya Pradesh and organized by the Field

Director, KTR, Mandla. The field level workshop was organized with an aim to ascertaining the status and current management practices so as to formulate appropriate strategies for their long-term management and conservation.

The workshop was attended by former field directors who have worked in Kanha Tiger Reserve, managers of other tiger reserves in the state of Madhya Pradesh and select scientists who have been associated with grassland research or management. Shri H.S. Panwar and Shri A.S. Parihar, former field directors of KTR, were also present during the workshop. The workshop was conducted under the chairmanship of Dr. H.S. Pabla, PCCF (Wildlife) and Chief Wildlife Warden, Madhya Pradesh. Dr. P.K. Mathur was invited as a resource person to the workshop, and he provided inputs on diversity, management practices and their implications and potential strategies for future management so as to maintain diversity and conservation values of the integral anthropogenic grassland component of KTR.

V International Galliformes Symposium, Chiang Mei, Thailand, *November 7-14, 2010.*

Dr. S. Sathyakumar participated in this symposium. He made four oral and four poster presentations that were based on results from WII's ongoing research projects on the galliformes.

One-week compulsory training course for IFS officers on 'Development of Afforestation /Reforestation Clean Development Mechanism (CDM) Project', Noida, *November 8-12, 2010.*

Dr. V.K. Melkani attended this training programme at Amity School of Natural Resources and Sustainable Development, Amity University, Noida, U.P.

National Science Congress for School Children, Vijayawada, *November 12-13, 2010.*

Shri Gopi G.V. participated as a resource person and presented a talk titled 'Wildlife Conservation-Issues and Challenges' at the National Science Congress for School Children, which was organized by DPS, Vijayawada.

Conference of Heads of States on Tiger Conservation, St. Petersburg, Russia, *November 18-26, 2010.*

Dr. Y.V. Jhala attended and provided technical inputs to the Conference of Heads of States on Tiger Conservation.

Workshop on 'Decision Support Toolbox for Ecosystem Management', Dehra Dun, *November 26, 2010.*

This workshop was organised by ICIMOD at the Wildlife Institute of India. Building on the most recent experience in ecosystem management at ICIMOD, the workshop demonstrated testing of tools to support ecosystem management processes at different spatial and temporal scales. These decision support tools addressed the needs of key stakeholders and are being developed though their direct involvement. The workshop was attended by all the postgraduate diploma officer trainees and staff of the RS, GIS and IT cells. Dr. Gautam Talukdar attended the workshop.

National workshop on 'Arachnology with Reference to Spiders', Daryapur, Maharashtra, *November 28-December 1, 2010.*

Dr. V.P. Uniyal and Shazia Quasin participated in this DST and UGC sponsored national workshop, which was organized by the Department of Zoology, Amravati University and J.D. Patel Sanglukar Mahavidyalaya, Daryapur, Maharashtra.

Multidisciplinary Committee Meeting of the Phata-Bhyung Hydro-Electric Project, Phata, Uttarakhand, *December 2, 2010.*

As a member of the Multidisciplinary Committee constituted by the Ministry of Environment and Forests for the Phata-Bhyung Hydro-Electric Project. Dr. S. Sathyakumar attended the first meeting and provided inputs during discussions and a field visit to the project site.

Consultation workshop on 'Interactive State of Environment Atlas-India', New Delhi, *December 2, 2010.*

The consultation workshop was organised by the Ministry of Environment and Forests in association with Development Alternatives. The basic objective of the scheme was to bring out an overview of the environmental status of the states/UTs for policy and decision-making in the GIS domain. It was anticipated that through the SoE database, governments and UT administrations would be able to integrate environmental dimensions in their social, economic and sustainable development planning. Dr. Gautam Talukdar attended the consultation workshop.

Workshop on 'Mountain Biodiversity & Impacts of Climate Change with Special Reference to Himalayan Biodiversity Hotspots', Almora, *December 6-8, 2010.*

Dr. B.S. Adhikari attended this workshop and presented a poster and a paper titled 'Changing Face of Timberline Ecotone in Western Himalaya: Trends from Phenological and Regeneration Studies'. The workshop was organized by GBPIHED, Kosi-Katarmal, Almora.

Sixth International Conference and Workshop on 'Wireless Communication and Sensor Networks', Indian Institute of Technology, Allahabad, *December 15-19, 2010.*

Dr. Gautam Talukdar provided inputs in the theme 'Wireless Sensor Networks with Focus on Wildlife and Forest Protection'. He sensitized the audience to the potential applications and the challenges to be overcome in this thematic area.

Meeting of the State Board for Wildlife, Government of Chattisgarh, Raipur, *December 16, 2010.*

Dr. Sushant Chowdhury attended the fourth meeting of the State Board for Wildlife, Government of Chattisgarh. The meeting was chaired by Dr. Raman Singh, Hon'ble Chief Minister, Chhattisgarh and Chair of the Board. In addition to confirmation of the minutes of the previous meeting and the action taken on the recommendations, 13 new items were taken up for discussion. Important among them were the following: extension of Barnawapara WLS, village relocations from Achanakmar TR, village relocations from Barnawapara WLS, wildlife estimations in the state, creation of Tiger Conservation Foundation and issues of infrastructure development clearances.

International Workshop on 'Biodiversity and Climate Change, Theme: Biodiversity Assessment, Modelling and Informatics', Indian Institute of Technology, Kharagpur, West Bengal, *December 19-20, 2010.*

The impacts of climate change and mitigation activities on biodiversity depend on the context, design and implementation of these activities. Climate change adaption activities can promote conservation and sustainable use of biodiversity and reduce the impact of changes in climate and climate extremes on biodiversity. The effectiveness of adaptation and mitigation activities can be enhanced when they are integrated with broader strategies designed to make the development paths more sustainable. In this context, Dr. Gautam presented the paper 'Biodiversity Informatics - Need of the Hour'.

1st Annual meeting of World Heritage related Category 2 Centres and relevant UNESCO Chairs and Higher Education and Research Centres, Manama, Kingdom of Bahrain, *December 19-20, 2010.*

The UNESCO World Heritage Centre, Paris and Kingdom of Bahrain as a follow-up of the direction given by the UNESCO General Assembly of States Parties to the World Heritage Convention organized the 1st Annual Meeting of World Heritage related Category 2 Centres and relevant UNESCO chains and higher education and research centres at Manama (Kingdom of Bahrain). Dr. V.B. Mathur, Dean was invited to participate in this meeting and

provide inputs on aspects of functioning of UNESCO Category 2 Centres pertaining to :

(i) Development of a shared strategy and vision.

(ii) Research and topics of thematic cooperation.

(iii) Communication, Knowledge management.

International Biodiversity Conference, Trivandrum, *December 27-29, 2010.*

Dr. V.K. Melkani participated in the conference and submitted an abstract on a paper "Mainstreaming Biodiversity Conservation: Issues & Perspectives". The abstract was accepted for presentation.

International workshop on 'Governance in Asian Protected Areas', Akita, Japan, *January 8-11, 2011.*

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 PoWPA enshrines the development of participatory, ecologically representative and effectively managed national and regional systems of protected areas, stretching where necessary across national boundaries, integrating with other land uses and contributing to human well-being. By emphasizing the equitable sharing of costs and benefits, recognizing the various governance types and giving prominence to management effectiveness and multiple benefits, the PoWPA is the most comprehensive global plan of action for effective implementation of protected areas (from designation to ongoing and effective management). India is a signatory to the PoWPA and has taken significant steps towards implementation of its various programme goals and elements.

The IUCN-WCPA (Japan) invited Dr. V.B. Mathur to participate in the international workshop on 'Governance in Asian Protected Areas'. Dr. Mathur, who is currently also the Deputy Regional Vice-Chair

of IUCN-WCPA Asia, made a presentation titled 'Implementing CBD Programme of Work on Protected Areas: Case Study from India'.

National seminar on 'Biodiversity Impact of Global Change', Ambala City, Haryana, *January 22, 2011.*

Dr. V.P. Uniyal participated in this national seminar, which was organized by the Department of Higher Education, Haryana at D.A.V. College, Ambala City. Developmental activities and habitat degredation lead to loss of biodiversity in the Himalaya. Dr. Uniyal discussed the role of indicator taxa in biodiversity monitoring.

Consultative workshop on 'Policy Issues while Preparing IUCN National Red Listing of Species in India', New Delhi, *February 3, 2011.*

This workshop was jointly organized by IUCN and the Ministry of Environment and Forests, Government of India. The workshop was attended, among others, by representatives of the MoEF, Wildlife Institute of India, Zoological Survey of India, Botanical Survey of India. IUCN, Bombay Natural History Society and Zoo Outreach Organization.

Some of the major recommendations of this workshop are provided here. Many organizations have been working independently on the red listing process, focusing on specific areas of interest as islands of excellence. The Ministry of Environment and Forests should provide a necessary coordinating mechanism to integrate the efforts of scientific and voluntary organizations into a scientifically acceptable, useful output. There is a broad consensus and 'in principle' agreement on the adoption of IUCN Regional Guidelines, which are primarily based on biological parameters, for red listing of species, both flora and fauna, at the country level. It was agreed that the process of red listing of species for a country would follow the framework of IUCN Regional Guidelines with flexibility for accommodating the specificities of the country's own requirement. To begin with, state level red listing is also important and can be continued simultaneously by the designated state nodal agency in consultation with scientific institutions, state forest departments and state biodiversity boards. Scientific institutions such as the Zoological Survey of India (ZSI), Botanical Survey of India (BSI) and Wildlife Institute of India (WII) should provide the necessary technical backstopping to the states/union territories in this regard. The work of red listing by states would, in due course of time, will serve as a source of information for the ongoing process of red listing of species at the central level. Dr. K. Sivakumar participated in the consultative workshop.

Science Conference, Kurukshetra, *February 9-10, 2011.*

Dr. V.P. Uniyal participated in the DST sponsored science conference at Kurukshetra University, Kurukshetra.

Regional workshop on 'Valuation of Livestock Production in Hindu Kush Himalayas (HKH), Kathmandu, Nepal, *February 14-15, 2011.*

Dr. S.A. Hussain participated in this regional workshop, which was organized by ICIMOD, Nepal.

National seminar on 'Challenges for Wildlife Conservation : Conflict to Co-existence' Nayagarh, Orissa, *February 19-20, 2011.*

Shri R. Suresh Kumar participated as the chief speaker in this national seminar, which was sponsored by the Department of Science and Technology and organized by the Department of Zoology, Nayagarh Autonomous College, Orissa.

Workshop on 'Results Framework Document (RFD)', New Delhi, *February, 22, 2011.*

Dr. V.K. Melkani participated in this one-day workshop, which was conducted by the Performance Management Division, Cabinet Secretariat, Government of India at Vigyan Bhavan.

National conference on 'Landscape Restoration Processes-Challenges and Opportunities', Dehra Dun, *February 22-23, 2011.*

The Forest Research Institute, Dehra Dun organized this national conference. The conference focused on landscape restoration processes. Dr. P.K. Mathur delivered the keynote address, titled 'Landscape Approach to Biodiversity Conservation'. Scientists, field managers, entrepreneurs and representatives of industries and the corporate sector participated in the conference.

International seminar on 'Technology, Energy and Sustainable Rural Environment', Varanasi, *February 23-25, 2011.*

Dr. Panna Lal presented a paper titled 'Application of remote sensing techniques to forest cover monitoring and tiger habitat evaluation in Bandhavgarh Tiger Reserve, Central India', which was jointly authored by Dr. Panna Lal, Dr. V.B. Mathur and Shri Qamar Qureshi. The seminar was organized by the Department of Geography, Banaras Hindu University, Varanasi.

Symposium on 'Management of Banni Grasslands', Bhuj, *March 4-5, 2011.*

This symposium was organized by the Gujarat Institute of Desert Ecology (GUIDE), Bhuj. The symposium was organized with an aim to assessing the status of the Banni grasslands in Kutchch district, Gujarat and to reviewing current management practices so as to formulate

appropriate strategies for effective management and conservation of vast saline grasslands and associated faunal species. Thus, the symposium aimed to bring together research and academic institutions, government and non-government organizations, policy makers and various stakeholders dedicated to research, conservation and restoration of the Banni grasslands.

The symposium was attended by scientists representing various organizations of Gujarat. Shri S.G. Mankad, IAS (Retd.), Chairman, GUIDE provided able guidance for organizing this symposium and steered the concluding session. Dr. P.K. Mathur was invited as a resource person to the symposium, and he presented a paper titled 'Indian Grasslands-Management Perspective'. He also chaired a technical session. The workshop was followed by a field visit to the Banni grasslands.

One-day workshop on 'Capacity Building for Range Forest Officers', Pune, *March 7, 2011.*

Dr. Bilal Habib participated and presented a paper at this workshop, which was organized by the Maharashtra Forest Department for its field staff. Dr. Bilal Habib presented an overview of the need for bio-diversity conservation and its importance.

National seminar on 'Gender and Development in India', Department of Political Science, D.A.V. College, Dehra Dun, *March 12-13, 2011.*

Dr. R. Badola participated in this seminar and presented a paper titled 'Women, Environment and Development' in the UGC sponsored National Seminar organised at DAV College.

National Conference on 'Potential of Diverse Biodiversity Conservation Approaches and Livelihood Concerns in India', Kolkata, *March 15-16, 2011.*

This conference was convened by the Institute of Development Studies, Kolkata. The conference was specifically aimed at deliberations on potential approaches to conservation of biodiversity and on concerns regarding livelihood. The conference was attended by distinguished foresters, wildlife managers and scientists. Dr. P.K. Mathur was one of the resource persons at the conference, and he presented a paper titled 'Landscape Approach to Conservation-Challenges and Prospects'. Dr. V.K. Melkani sent a paper titled 'Sustaining Livelihoods under Eco-development Initiative in Kalakad Mundanthurai Tiger Reserve in Southern Tamil Nadu: Key Results and Future Challenges' to the Institute of Development Studies, Kolkata (IDSK). The paper was accepted and will be published in the proceedings of the conference.

National workshop-cum-training programme on 'Applications of Bioinformatics in Forestry', Dehra Dun, *March 21-22, 2011.*

This was organized by ICFRE and held at the Bioinformatics Centre, Division of Forest Informatics, Forest Research Institute, Dehra Dun. The national workshop-cum-training programme made the participants aware of how to develop various biodiversity databases. As part of this larger goal, the workshop trained the scientists/research scholars in exploiting the available information effectively and generating awareness about digitization and interlinking of biodiversity databases. Dr. Gautam Talukdar participated in the workshop and presented a paper.

Workshop on 'Higher Education in Uttarakhand', Dehra Dun, *March 22, 2011.*

This workshop was organized by Doon University, Dehra Dun. The workshop aimed to review the status of higher education in Uttarakhand and plan for necessary reforms/improvements. Smt. Margret Alva, Hon'ble Governor, Uttarakhand inaugurated the workshop. The vice chancellors of all the universities based in Uttarakhand and representatives/directors of central government institutions located in Dehra Dun dealing with higher education attended the workshop. Dr. P.K. Mathur represented WII at the workshop. The vice chancellors made presentations on the need for various reforms in higher education and highlighted the need of effective coordination among them and with other state/central government supported institutions.

International Conference on Forensic Nanotechnology, Ahmedabad, *March 25-26, 2011.*

Mr. Malay Shukla participated in this international conference, which was organized by Gujarat Forensic Science University, Gandhinagar and held at Science City, Ahmedabad, Gujarat.

International conference on Tiger Conservation, New Delhi, *March 28-30, 2011.*

Dr. Bilal Habib participated in this international conference, held at Vigyan Bhavan.

Inception workshop on 'Himalayan Climate Change Impact and Adaptation Assessment (HICIA) in Hindu Kush Himalaya Region', Kathmandu, *March 28-30, 2011.*

Dr. S.A. Hussain participated in this inception workshop, which was organized by ICIMOD.

The workshop's specific objectives were to :

(i) Reach a common vision on the project orientation and strategic principles.

(ii) Identify the project niche and priorities.

(iii) Clarify the different project components and ensure their convergence.

(iv) Identify the operational steps for project implementation and develop an overall work plan.

(v) Identify strategic and operational partners for the project.

Study Tour

Study abroad program on 'Wildlife Management and Conservation', Dehra Dun, *December 18, 2010-January 3, 2011.*

This study abroad program was organized by the Wildlife Institute of India for North Carolina State University students. In all, 16 under-graduate (animal science majors) and DVM students from North Carolina State University, Raleigh, NC attended the programme. The programme was designed with the objective of educating and familiarizing students about wildlife management practices in India, exposing students to the current conservation challenges faced by wildlife managers and discussing strategies to address them and acquainting students with aspects of Indian culture, traditions and history while integrating them with the wildlife education to enhance their learning experience.

The course provided an overview of the field strategies, basics of laboratory analysis and interpretation approaches as well as tools that wildlife biologists use in management and conservation of the wildlife.

The course included three modules that focused on :

(i) Research and management of wildlife in a national park.

(ii) Wildlife techniques and monitoring.

(iii) Lectures on the theory of various aspects of wildlife management and conservation, wildlife forensics, wildlife health and human-wildlife conflict issues.

Besides theoretical inputs at WII, the participants were provided field inputs at National Zoological Park, New Delhi; Kanha National Park, M.P.; Sariska Tiger Reserve and Jaipur Zoo, Rajasthan; and Rajaji National Park, Uttarakhand.

PROFESSIONAL SUPPORT

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- COLLABORATION
- SERVICES
- CONSULTANCY PROJECT
- ENVIRONMENTAL IMPACT ASSESSMENT
- INFORMATION TECHNOLOGY AND REMOTE SENSING & GEOGRAPHICAL INFORMATION SYSTEM
- NATIONAL WILDLIFE DATABASE
- WILDLIFE FORENSIC
- WILDLIFE EXTENSION & AUDIO VISUAL
- LIBRARY & DOCUMENTATION CENTRE
- ENVIS CENTRE
- RESEARCH LABORATORY
- HERBARIUM
- WILDLIFE HEALTH SERVICES
- CAPTIVE BREEDING & ZOO MANAGEMENT
- WILDLIFE POLICY RESEARCH
- RIGHT TO INFORMATION AND VIGILANCE
- CAMPUS DEVELOPMENT
- SPORTS

International Collaboration

Professionalizing Protected Area Management for the 21st Century-A World Heritage Biodiversity Programme for India (WHBPI)

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 the 10-year World Heritage Biodiversity Programme (WHBP) in India. The goal of this WHB Programme 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 the Wildlife Institute of India (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 UNF, UNESCO, Ford Foundation and ATREE. UNF and its partners have agreed to provide funds amounting to US$1.83 million for the 4-year implementation phase of 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; and Kaziranga National Park and Manas Wildlife Sanctuary, Assam. The responsibilities for implementation of the project activities in Keoladeo and Nanda Devi National Park were assigned to WII and those in Kaziranga and Manas to ATREE, Bangalore. Field equipment and gear were 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. A total of 50 students each from the local communities and staff were selected in Keoladeo and Nanda Devi National Park on the basis of a competitive examination for the award of 'World Heritage Biodiversity Scholarships'. The selected 100 students are serving as 'Ambassadors' to carry forward the message of conservation awareness and natural heritage conservation. 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.

Services

Management Effectiveness Evaluation (MEE) of Tiger Reserves in India (2010-2011)

The National Tiger Conservation Authority (NTCA) assigned the responsibility of technical backstopping of Independent Management Effectiveness Evaluation (MEE) of tiger reserves in India. The NTCA constituted five Independent MEE Committees to evaluate all 39 tiger reserves. The Institute prepared a technical manual to guide the MEE process. A meeting with the committee members and field directors was organized by NTCA on July 7, 2010 in New Delhi to brief them about the MEE process and criteria. The committee members visited all 39 tiger reserves and submitted their evaluation reports, which were discussed in a meeting with the field directors on February 17-18, 2011 in New Delhi. The WII team is finalizing the MEE report.

Technical and Advisory Services to MoEF/State Forest Departments

Dr. G.S. Rawat worked as a member of the Sub-group (Monitoring)-GOI-UNDP-GEF Project on Mainstreaming Conservation and Sustainable Use of Medicinal Plants in three Indian States. He also

worked as a member of the Project Advisory Committee, GOI-UNDP-GEF Project 'Mainstreaming conservation and sustainable use of medicinal plants in the state of Uttarakhand'.

Technical and advisory services to other agencies

Dr. G.S. Rawat worked as a member of the Project Screening Committee, National Medicinal Plants Board, Department of Ayush, Government of India and as a member of the Sub-Task Force on Protection of Plant Varieties and Farmers' Rights (Orchids), ICAR, Government of India.

Environmental Impact Assessment

Advisory support to MoEF

As member of the Expert Appraisal Committee (Mining Projects) of the MoEF, Dr. B.K. Mishra helped the Impact Assessment Agency of the Government of India with screening, scoping, and appraising mining project proposals. Dr. Mishra scrutinized projects for environmental clearance and 12-15 ToRs every month for environmental acceptance. Dr. A.K. Bhardwaj coordinated all the tasks related to environmental appraisal of developmental projects according to the decisions of the standing committee of the National Wildlife Board.

Inspection with respect to Pirna Mine, North Goa

Dr. B.K. Mishra, Member, Government of India Sub-Committee of EAC visited the Pirna Mine site of North Goa during June 20-25, 2010 as per the directives of the Hon'ble National Environment Appellate Authority (NEAA), studied possible impacts of mining on the agriculture, biodiversity, rivers, schools, groundwater, habitations, health, etc. and held meetings with the local community to examine public opposition to the project. On the basis of a site inspection, a rapid impact assessment and interactions with the local people and officials of GSPCB, Forest Department and other departments, he submitted recommendations in the form of a report to the EIA division of the MoEF.

Professional support as a referee to review manuscript

In August 2010, the editor of International Journal of Biodiversity and Conservation (IJBC) appointed Dr. P.K. Mathur as a referee to review the manuscript IJBC-10-057, entitled 'Brahmaputra River islands as potential corridors for dispersing tigers: A case study from Assam, India'. Comments were provided online.

Professional support to review manuscript

Dr. P.K. Mathur reviewed a manuscript sent by the editor of Indian Forester, FRI, Dehra Dun. He provided comments on a manuscript entitled 'Changing Perspectives in Forest and Wildlife Conservation in Kerala' on December 2, 2010.

Professional support to review manuscript

Dr. P.K. Mathur reviewed a manuscript entitled 'Geospatial technology for wildlife management in context to tiger conservation" sent by the editor of Current Science, Bangalore. He provided comments on February 17, 2011.

Technical inputs to the Arunachal Pradesh State Forest Department

Shri R. Suresh Kmar provided technical inputs to the Arunachal Pradesh State Forest Department for a proposed ex situ conservation programme for the hoolock gibbon in Arunachal Pradesh during May 11-13, 2010.

Services to State Forest Department

Ecological assessment of sites designated for collection of sand and boulders from river beds of Uttarakhand

Collection of river bed materials (RBM) such as sand and boulders is an important economic activity related to development of infrastructure. In Uttarakhand, most rivers that run through bhabar tracts are targeted for their sand and boulders. The Uttarakhand Forest Department (UKFD), under the directives of the Ministry of Environment and Forests (MoEF), commissioned WII to assess the impacts of sand/boulder mining on wildlife values in eight rivers (Kosi, Dabka, Nihal, Gola, Kiroda, Sarda, Yamuna at Rampur Mandi and Tons near Kalsi).

The primary focus of the assessment was to :

(i) Quantify the adverse impacts of RBM collection on wildlife populations and their habitats.

(ii) Identify and delineate wildlife corridors along the proposed mining areas.

(iii) Propose appropriate ameliorative measures to minimize/eliminate the impacts.

(iv) Assess the adverse impacts of non-collection of RBM in a river stretch identified as a wildlife corridor on the river geometry and erosion.

(v) Develop a management plan for identified wildlife corridors.

UKFD also requested WII to accord priority to assessment of the Gola River. Based on the field studies at the Gola River mining site and desk reviews.

The following conclusions and recommendations were provided in an interim report.

(i) Wildlife evidence in the adjoining forests along the entire stretch was recorded. Large mammals such as the elephant, large carnivores and their prey species continue to occupy the habitats. The 2.5 km stretch of river designated as the

Gola River Corridor is used by wild animals including the leopard and major prey species.

(ii) The current level of mining activity along the 29 km stretch (excluding the prohibited areas of 2.5 km of corridor and a bypass bridge) is extensive. The river course is deeply excavated, potentially causing erosion and habitat loss along the river stretch.

(iii) Presently, there is no evidence to suggest that non-mining in the 2.5 km corridor stretch is adversely affecting the wildlife values of the area. In this non-mined stretch, the river has taken its natural course in the last monsoon, which is normal for a river in the terai belt. Such flows, if allowed unhindered, lead to periodic flooding, thereby maintaining the characteristics of the terai ecosystem, which is a mix of tall grasslands interspersed with sparse woodlands. The habitat occupancy and intensity of wildlife movement have been observed to be negatively correlated to the distance from the mined area, thereby indicating a negative impact on wildlife use in mined areas.

Keeping the above points in view, the following measures are recommended for the interim period :

(i) The status quo of non-extraction of RBM in the designated 2.5 km corridor area need to be maintained for the present.

(ii) Mining in the remaining portion of the Gola River through the 11 gates may be allowed, subject to appropriate regulations with regard to the depth of mining in this zone and guidelines issued by MoEF Vide D.O. No. Z-11012/3/2009-IA.II (M) dated June 1, 2010.

(iii) As at least 6,416 registered labourers settle in the area during the mining season and the quantity of fuel wood provided to them by the Forest Department for their daily needs is inadequate, extraction of biomass from the adjoining forests is obvious. Therefore, it was suggested that the UKFD may ensure provisioning of adequate fuel wood on a regular basis till an arrangement is made to supply alternatives to fuel wood. The work on the other mining sites at seven rivers is in progress and is expected to be over by September 2011.

Global Biodiversity Information Facility-Atlas for Living Australia Mentoring Project

In recent years, there has been a global upwelling of digitizing biodiversity among institutions, museums, and organizations that collect observational records and document biodiversity. Global Biodiversity Information Facility (GBIF) and Biodiversity Conservation Information System (BCIS) of IUCN are among the well established digital repositories. Biodiversity conservation can be stepped up and geared to meet the requirements of decision makers only when authentic information is shared and made easily accessible. Therefore, digitized information on wildlife resources in the country will hasten informatics mediated wildlife conservation.

Recognizing this need, the Ministry of Environment and Forests, Government of India has initiated the setting up of an 'Indian Biodiversity Information Facility' (INBIF), as part of the GBIF-India initiative. The Wildlife Institute of India (WII) will serve as the coordinating node for this activity. The creation of INBIF has presented an opportunity to regroup and gather scattered information from various repositories and integrate them under one portal. The INBIF will facilitate rapid and free access to biodiversity information. The Atlas of Living Australia (ALA) has been structured and executed to deal with large volumes of information from different sources, covering a large geographic area and capturing a large amount of biodiversity information. There are striking similarities between Australia and India in the quantum and variety of biodiversity information and its sources. In this connection, a mentoring project was initiated with ALA, with support from GBIF. It is felt that this collaboration will provide standards for INBIF. It is expected that INBIF will be launched in the next 1-2 years with mentoring from ALA.

Consultancy Project
Development of Appropriate Techniques for Minimizing Man-animal Conflicts

Funding Source
Gujarat Forest Department

Investigator
Dr. N.P.S. Chauhan

Researcher
Devender Kumar Thakur

Date of Initiation
August 2009

Date of Completion
October 2011

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 selected protected areas/managed forests in Gujarat.

(ii) To help procure and fabricate 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.

(iv) To establish a database on wildlife damage problems and their control and help in providing the ADC extension and education packages for dissemination to people in affected areas.

Progress

Surveys were conducted in Vadodara, Surat and Valsad circles, covering Vadodara, Dahod, Panchmahal, Narmada, Tapi, Valsad and Dang districts. Information has been collected from various affected areas of Chotta Udaipur, Baria, Godra, Rajpipla (East), Rajpipla (West), Vyara, Valsad (North), Valsad (South), Dang (North) and Dang (South) forest divisions. Besides, information has also been collected from in and around Jessore Wildlife Sanctuary (WLS), Banaskantha, Purna WLS, Dangs; Jambughoda WLS, Panchmahal district and Ratanmahal Sloth Bear Sanctuary, Dahod district. In all these affected areas, leopards and sloth bears were reported to venture often into human habitations, and this resulted in serious human-leopard and human-sloth bear conflicts.

Villages located in and around protected areas and forest divisions in Vadodara, Dahod, Panchmahal, Narmada, Valsad and Dang districts were found to grow mainly tuar, urad, moong, maize, jowar and bajra. Sugarcane and banana were grown only in south Gujarat, *i.e.* Narmada, Tapi, Navsari, Dang and Valsad districts. Damage to these agricultural crops was mainly caused by nilgai and sloth bear. Wild pigs and deer species were also responsible for crop damage in some pockets. In Godra Forest Division (FD), a reconnaissance survey was conducted in and around Jamughoda WLS. Information on human casualties caused by leopards and sloth bears and crop damage by wild animals has been collected. Information on human-

wildlife conflicts in the form of human casualties caused by leopards, sloth bears and crocodiles and on livestock killing by leopards has been collected from the Rajpipla (East) FD and Rajpipla (West) FD of Narmada district.

Livestock is the second most important component of the traditional subsistence economy in Gujarat. Amongst livestock, cow, calf, bull, buffalo, goat and horse were predated upon by leopards. Cows and bulls suffered the most in these areas. Livestock killings occurred throughout the year. Agricultural crop damage was widely reported from many parts. The most affected districts were Amreli, Banaskantha, Kutch, Patan and Rajkot. In contrast, in the other districts, the extent of the crop damage problem was low to medium.

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Cells
Environmental Impact Assessment

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

Funding source
Government of Rajasthan

Investigators
Dr. Asha Rajvanshi, Dr. S.P. Goyal and Dr. V.B. Mathur

Researcher
Roshni Arora

Date of Initiation
August 2009

Date of Completion
November 2010

Objectives

The objectives of the project were to :

(i) Assess key floral and faunal attributes in the proposed command area of NCP in Rajasthan.

(ii) Inventorise floral resources of medicinal and forage values.

(iii) Identify impacts on key flora and fauna on account of construction of canals and on account of water flows in the canal system and drains, including those due to irrigated agriculture.

(iv) Suggest mitigation / management including a monitoring plan to minimize adverse impacts on key floral and faunal attributes.

Progress

To address the first and second objectives of the study, a reconnaissance survey and intensive field sampling were carried out in the command area of the Narmada canal during winter (November-December) and summer (February-June) in the reporting year. The study area was divided into five categories based on the suitability of the land for irrigation and intensity of agricultural activities. A total of 33 line transects were laid in different land categories to assess floral and faunal values. An effort was made to record animal absence / presence, diversity and encounter rates through direct and indirect observations (pellets, droppings, scats, animal tracks and signs) in the study area. Sampling for estimating trees and shrubs was done every 250 m using the point-centred quarter method and circular plots, respectively. Additional information on the human-wildlife conflict and advantages/disadvantages of irrigation inputs was gathered through discussions with local people. The primary and secondary data collected during the study period were analysed to assess the types of impacts on the flora and fauna on account of the construction of canals and practicing irrigated agriculture. Appropriate mitigation / management plans were suggested to address these impacts.

Outputs and Outcomes

A total of 42 species of plant, 12 species of mammal and 55 species of bird were recorded within the project area during the study period.

The major impacts of the canal predicted on the basis of the study are :

(a) Degradation and encroachment of grazing lands which are good habitats for desert wildlife such as the chinkara.

(b) Formation of temporary wetlands that may attract water birds.

(c) Loss of habitat for desert specialists such as desert gerbils and Indian desert jirds.

The following mitigation measures were proposed to address these impacts :

(a) Protection of grazing lands.

(b) Habitat improvement and management within grazing lands.

(c) Creation of community reserves.

(d) Protection of gerbil habitats.

(e) Erection of natural fences around crop fields.

(f) Creative management of 'escape areas' as wetland habitats.

(g) Protection of saline lands as wildlife habitats.

Milestone

The final report was submitted to the Narmada Control Authority (NCA) in November 2010. The findings and recommendations were presented to the NCA on February 1, 2011, following which the NCA gave its approval of the report.

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Assessment of Cumulative Impacts of Hydroelectric Projects on Aquatic and Terrestrial Biodiversity in Alaknanda and Bhagirathi Basins, Uttarakhand

Funding Source
Ministry of Environment and Forests

Investigators
Dr. V.B. Mathur, Dr. G.S. Rawat, Shri B.C. Choudhury, Dr. V.K. Melkani, Shri. V.K. Uniyal, Dr. Asha Rajvanshi, Dr. S. Sathyakumar, Dr. K. Sivakumar, Dr. J.A. Johnson and Dr. K. Ramesh

Researchers
Manish Kandwal, Nand K. Dimri, Ajay Maletha, P. Gangaiamaran and Roshni Arora

Date of Initiation
January 2011

Date of Completion
October 2011

Objectives

The objectives of the project are to :

(i) Assess the baseline status of rare, endangered and threatened (RET) species of flora and fauna dependent on the riverine habitats and floodplains of the Alaknanda and Bhagirathi river basins.

(ii) Identify the critical wildlife habitats along the existing and planned hydroelectric projects located on the Alaknanda and Bhagirathi rivers up to Devaprayag.

(iii) Delineate river stretches critical for conservation of rare, endangered and threatened (RET) aquatic species.

(iv) Assess the key habitat variables for RET species, including minimum flows and volume of water required for the ecological sustainability of the two rivers.

Progress

Desk reviews, reconnaissance surveys and detailed field surveys were undertaken during the reporting period. Desk studies involved reviewing and gleaning information from detailed project reports (DPRs), EIA reports and EMP reports for all the 69 hydropower projects facilitated by the project authorities and other organizations, for improving our understanding of the project profile and the nature and extent of activities envisaged to visualize the range of impacts. An extensive and elaborate literature survey was undertaken to pull out information on floral and faunal (terrestrial and aquatic) values within the study area. A series of reconnaissance surveys in the study area, i.e. the Alaknanda and Bhagirathi river basins, were undertaken in January and February, and information was gathered on the biodiversity components, including the terrestrial and aquatic elements.

Outputs and Outcomes

It was evident that all the five projects involve a reduction in forest cover and a loss of wildlife values from submergence, land clearing or exploitation. However, of these five projects, three projects, namely Kotlibhel II, Alaknanda-Badrinath and Kotlibhel IB, support significant ecological/wildlife values that include irreplaceable components. Any

form of development in these areas will have irreversible and unmitigable negative impacts on these values. With regard to the other two projects (Kotlibhel IA and Vishnugad-Pipalkoti), the overall impacts on biodiversity values are relatively less.

The final report, which will include a detailed assessment of all the 69 projects, will be submitted at the end of September 2011, for which the last leg of field surveys, data compilation, analysis and evaluation will be completed in the next two months (*i.e.* August and September 2011).

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Information Technology, Remote Sensing and Geographical Information System

The Information Technology, Remote Sensing and Geographic Information System facility is a hallmark of WII for providing cutting edge technology relevant to wildlife research, education and training. The facility is available 24 hours a day to the faculty members, trainees/researchers/students and collaborators working with the Institute. A large number of desktop computers configured with updated operating systems and specialized analytical software for data processing and research purposes are made available in a dedicated lab. The computer facility is provided with a wide range of hardware connected to a local area network (LAN). There are Intel Pentium Xeon/Itanium servers for the Internet, Intranet, database management and library automation services; workstations; a storage area network (SAN); and more than 250 nodes. The Institute has Internet connectivity through a leased line. Wi-Fi connectivity has also been provided almost throughout the campus. All the computers of the Institute are provided with Internet and mailing services. The Institute is on the path of e-governance for improved efficiency.

The state-of-the-art Geoinformatics Laboratory, providing services related to geographic information system, remote sensing and global positioning system (GPS) technology, at WII caters to the research and training programmes of the Institute and to the demand from field managers. The laboratory is equipped with the latest major software packages such as Idrisi, ArcGIS and ERDAS Imagine, and there are several other spatial analysis tools for modelling species distributions 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., P.G. diploma and certificate courses at WII, and hands-on training is provided to other graduate students and interns. Work is in progress for the development of a National Wildlife Spatial Database.

IT facility enhancement :

During the reporting year, the IT facility of the Institute was further enhanced by upgrading the leased line Internet connectivity bandwidth to 15 Mbps through fibre optics. A new Internet server based on a Xeon processor with 8 GB RAM and 3 × 300 GB SAS HDDs has been installed. Users provided with email ids on this server have been allotted a mailbox with 1 GB of disk space each. For the smooth functioning and management of the Institute's computer laboratory, a Biometric (fingerprint based) Access Control System and security surveillance system have been installed. The digital image processing software ERDAS Imagine 8.7 (five-user license) has been upgraded to a newer version, ERDAS Imagine 2010.

Application of geoinformatics to research projects :

Geoinformatics technology is being used in most research projects of the Institute for wildlife research and conservation. Work is in progress on the

development of a spatial database with the boundaries of all the national parks and wildlife sanctuaries in the country. Similarly, digitization of the division, range and beat boundaries of the 17 tiger range states in the country is in progress. The country level data on climate, vegetation, topography and animal distribution is also in progress.

Wildlife Forensic Cell

The main objectives of the Wildlife Forensic Cell are :

(i) Identification of species from wildlife articles through the use of morphometric and DNA analysis to deal with wildlife offences.

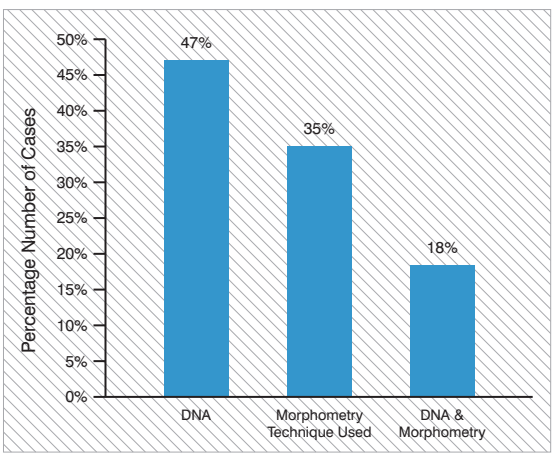
(ii) Standardization of techniques used in morphometric and DNA analysis for the identification of species from wildlife parts and products.

(iii) Developing a repository of wildlife reference samples and developing genetic profiles of different animals.

(iv) Sensitizing various enforcement agencies to the issues involved in proper collection of data and crime scene examination through training and workshops.

During the reporting period, the cell received different parts and products for identification of species in 285 wildlife offence cases. Sixty-eight percent of these were received from forest departments, 18% from the police, 11% from courts and 3% from other enforcement agencies.

Protocols based on different techniques are needed for species identification using morphometric, DNA, analytical and other techniques when dealing with wildlife offences in India. Of the total cases (n = 285) received during the reporting year, 47% (n = 135) of the cases required the use of a DNA based approach, whereas 35% (n = 100) of the cases could be solved using morphometric techniques. The rest of the cases (18%, n = 50) required a combination of other analytical techniques.



Distribution of cases based on different techniques needed for analysis (n = 285)

Different wildlife articles such as skins, shawls, meat, claws, antlers, hairs and paws were seized in these cases. Skins formed the majority (n = 149). A large number of shawls (n = 50) were also seized. Other major items seized in considerable numbers include painting brushes, pods, claws, canine teeth and antlers. A few typical articles were received as part of wildlife seizure. Of 149 skin samples received from seizures made in different parts of India, 38%(n = 56) were identified as being leopard skins, 27% of the skins were of domestic species, 10% of the skins were of goral, and wild pig, chital, otters and barking deer skins were seized in 3% of the cases each. The remaining 11% of the skins were of other species such as the tiger sambar and nilgai. Two percent of the skins were unidentified and required the use of DNA based analysis. Of 246 cases taken up for analysis during the reporting period, 214 cases were solved on the basis of the protocols developed, and 50 cases were returned because of a lack of protocols or reference samples.

A new initiative was undertaken in collaboration with Gujarat Forensic Science University (GFSU) for the development of protocols to deal with wildlife offence cases using advanced wildlife forensic analytical techniques. A few samples referred to the Wildlife Forensic Cell of the Institute were difficult to analyse using morphometric or DNA based techniques. Most such samples were finished products made from antlers of deer species such as chital, sambar, hog deer, barking deer, swamp deer, brow-antlered deer and hangul, bone fragments and a few products of ivory. Therefore, the cell attempted to optimize and standardize protocols by analysing such samples using advanced analytical techniques such as FT-Raman spectroscopy, ICP-MS and EDXRF. Two studies were carried out in collaboration with GFSU, Gandhinagar as a part of dissertation work. A study was also carried out on identification of seven species of civet in India using the SEM-EDX technique, and the findings indicate that it is possible to differentiate all seven species.

Sequences submitted to National Centre for Biotechnology Information (NCBI), USA :

A total of 108 DNA sequences of Cyt. b, 12S rRNA and 16S rRNA genes were submitted to NCBI by the Wildlife Forensic Cell. Of these, 46 sequences were accepted and uploaded to NCBI (Table 1), while the remaining 62 sequences are going through the acceptance process.

Table 1. List of sequences submitted to National Centre for Biotechnology Information, USA by Wildlife Forensic Cell

S. no.	Accession no.	Gene	Species
1	HQ404363	Cyt b	*Paradoxurus hermaphroditus*
2	HQ404364	Control region	*Paradoxurus hermaphroditus*
3	HQ634947	12S rRNA	*Viverricula indica*
4	HQ634948	12S rRNA	*Viverricula indica*
5	HQ634949	12S rRNA	*Paradoxurus hermaphroditus*
6	HQ634950	12S rRNA	*Viverra zibetha*
7	HQ634951	12S rRNA	*Viverricula indica*
8	HQ634952	12S rRNA	*Paguma larvata*
9	HQ634953	12S rRNA	*Paradoxurus hermaphroditus*
10	HQ634954	12S rRNA	*Paguma larvata*
11	HQ634955	12S rRNA	*Paradoxurus hermaphroditus*
12	HQ634956	12S rRNA	*Paradoxurus hermaphroditus*
13	HQ634957	12S rRNA	*Paradoxurus hermaphroditus*
14	HQ634958	12S rRNA	*Viverricula indica*
15	HQ634959	12S rRNA	*Paguma larvata*
16	HQ634960	12S rRNA	*Viverricula indica*
17	HQ634961	12S rRNA	*Paradoxurus hermaphroditus*
18	HQ634962	12S rRNA	*Paradoxurus hermaphroditus*
19	HQ634963	12S rRNA	*Paguma larvata*
20	HQ634964	12S rRNA	*Paradoxurus hermaphroditus*
21	HQ634965	12S rRNA	*Paradoxurus hermaphroditus*
22	HQ634966	12S Rrna	*Paguma larvata*
23	HQ634967	12S Rrna	*Viverricula indica*
24	HQ634968	12S Rrna	*Viverricula indica*
25	HQ833289	Control region	*Viverricula indica*
26	HQ833290	Control region	*Viverricula indica*
27	HQ833291	Control region	*Paradoxurus hermaphroditus*
28	HQ833292	Control region	*Viverra zibetha*
29	HQ833293	Control region	*Viverricula indica*
30	HQ833294	Control region	*Paguma larvata*
31	HQ833295	Control region	*Paradoxurus hermaphroditus*
32	HQ833296	Control region	*Paguma larvata*
33	HQ833297	Control region	*Paradoxurus hermaphroditus*
34	HQ833298	Control region	*Paradoxurus hermaphroditus*

35	HQ833299	Control region	*Paradoxurus hermaphroditus*
36	HQ833300	Control region	*Viverricula indica isolate*
37	HQ833301	Control region	*Paguma larvata*
38	HQ833302	Control region	*Viverricula indica*
39	HQ833303	Control region	*Paradoxurus hermaphroditus*
40	HQ833304	Control region	*Paradoxurus hermaphroditus*
41	HQ833305	Control region	*Paguma larvata*
42	HQ833306	Control region	*Paradoxurus hermaphroditus*
43	HQ833307	Control region	*Paradoxurus hermaphroditus*
44	HQ833308	Control region	*Paguma larvata*
45	HQ833309	Control region	*Viverricula indica*
46	HQ833310	Control region	*Viverricula indica*

Wildlife Extension and Audio Visual

The cell caters to the needs of various academic activities. It maintains 16 mm films, video films, synchronized programmes, CDs/DVDs, a conference system, a projection system, audio visual equipment, a still camera and video cameras with accessories and a photo library.

As in every year, World Environment Day was celebrated by the Institute on June 5, 2010. It was an occasion to create awareness in the younger generation. The theme for World Environment Day, 2010 was 'Many Species. One Planet. One Future', as declared by the United Nations Environment Programme (UNEP). It echoes an urgent call to conserve the diversity of life on our planet. The following activities were organized for school children at Galaxian International School, Dehra Dun by the Institute on this day :

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(i) A clay workshop.

(ii) A drawing and painting competition. More than 80 children participated in these activities. Shri Ambar Agnihotri and Smt. Monica Agnihotri, potter and ceramist, New Delhi were invited to conduct a clay workshop. A workshop was organized for the families of the Institute's faculty members also.

Wildlife Week was celebrated at the Institute during October 2-8, 2010. The main aim of Wildlife Week was to make the younger generation aware about the importance of wildlife. It was aimed at motivating them to learn how they can help in protecting animals and birds.

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The following activities were organized by the Institute during Wildlife Week :

(i) A drawing competition was organized on October 4, 2010, in which 80 students from five schools, i.e. Raja Ram Mohan Roy Academy, Constancia School, Hilton's School, St. Jude's School and Lovedale Academy, Dehra Dun participated. There were three groups of students participating in the drawing competition. Different themes were given to the students for the competition, such as 'My Favourite Animal' for classes III-V, 'Forest & Wildlife' for VI-VII, and 'Tiger Conservation' for VIII-IX.

(ii) A talk was delivered by Dr. Parag Nigam, titled 'Healthy Ecosystem, Healthy World'. Dr. Nigam told the students about the present conditions of the ecosystems, future problems and strategies to deal with the challenges. A total of 100 students and teachers from some schools were present during the talk.

(iii) A nature trail visit was conducted for 30 students of St. Mary's School on October 7, 2010.

(iv) After the visit, a quiz competition was also conducted for the students. Four groups with five students each participated in the quiz. The quiz was conducted by Ms. Manjari Malviya. The winning teams received the prizes.

(v) A talk was delivered by Shri M.M. Babu on October 8, 2010 at Lovedale Academy, Dehra Dun.

The 8th Inter-School Wildlife and Environment Quiz, a collaborative activity of the Wildlife Institute of India and Friends of Doon Society, was organized on October 6, 2010 at the Wildlife Institute of India. Eight schools participated in the elimination round, and five of them qualified. Welham Girls topped the list and won the WII-FoD Rolling Trophy and Book Prize and a Sameer Ghosh Memorial Nature and Wildlife Prize (rolling trophy and book token worth Rs.1,500/). Ann Mary School won the second spot and received a WII-FoD book prize and Sameer Ghosh Memorial Nature and Wildlife Prize (book token worth Rs.1,000/-). The third position was won by Doon School, which received a WII-FoD Book Prize and Sameer Ghosh Memorial Nature and Wildlife Prize (book token worth Rs.500/-). Ms. Savita, Principal, Central Academy for State Forest

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Service (CASFS), graced the occasion as the chief guest and distributed the prizes to the winning teams.

Library and Documentation Centre

The Library and Documentation Centre (L&DC) was established in line with WII's mission to be a multidisciplinary information and learning resource centre on biodiversity conservation and management.

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The Library & Documentation Centre has the following objectives :

(i) To serve as a repository of all wildlife related literature published in India.

(ii) To acquire, organize and disseminate all relevant literature from around the world on biodiversity conservation and related fields.

(iii) To serve users through normal and special library and information services, such as circulation, reference, 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 :

(a) WII.

(b) Protected areas all over the country.

(c) Institutions engaged in nature conservation research in the country and abroad.

(d) Universities and colleges.

(e) Individual scholars working in related areas, NGOs, etc.

The L&DC now holds over 27,966 books, 25,000 newspaper clippings, 7,355 maps/toposheets and more than 6,459 bound volumes of old and rare journals. The library also maintains a good collection of scientific papers. It subscribes to more than 490 print and online journals.

The L&DC is fully computerized, using LIBSYS Library Management Software (WEBOPAC), UNESCO'S WINISIS software, CD servers, barcoding and related technologies. For optimum resources use by researchers, students, officer trainees and other users, 12 computer terminals are made available in the library premises and the faculty desks have been inter-connected with a LAN. Being connected to the library facility, the users have the privilege of accessing all in-house databases such as books, reprints, Indian wildlife abstracts, the map/toposheet collection, press clippings and

specialized bibliographic databases. Users also have access to an online database on ecology and wildlife studies worldwide from 1935 to the present. The L&DC provides a variety of library and information services to its users.

During the reporting year, over 29,903 pages of photocopies were provided to the users. Approximately 48,350 documents were issued and consulted during the reporting period. Value added services were provided to 245 clients, and ready reference services were provided to around 4300 clients. Approximately 600 queries from outside users were attended to, and more than 7500 bibliographic references were provided to users.

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.

(iii) Facilitate research and training activities in wildlife by providing bibliographic references on protected areas, habitat types and animal species.

During the reporting year, the main thrust of the activities was on updating the databases on protected areas and species and wildlife bibliography, based collection of information from various possible sources. The Review of the Protected Area Network Report was also updated with protected areas newly notified during the reporting period. The state summaries of the PA 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 (by March 2011) there are 668 protected areas, including 102 national parks, 515 wildlife sanctuaries, four community reserves and 47 conservation reserves in the country, covering 1,61,222 km^2, which is 4.90% 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 adding the literature published on Indian wildlife in the various issues of journals/periodicals received during the reporting period.

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 the Wildlife Institute of India. The theme 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.

(iv) Promote national and international co-operation through networking and exchange of wildlife related information.

During the reporting period work on ENVIS Bulletin 'Telemetry in India' was carried out.

Research Laboratory

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 systems, digital pH meters, digital conductivity meters, flame photometers and analytical balances, required for analysis of various physio-chemical parameters of ecological samples. Teaching classes, followed by practical sessions, were conducted for various ongoing courses of the Institute and for students from other organizations/ universities, i.e. FRI University and WWF, New Delhi.

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The practicals included analysis of herbivore pellets and carnivore scats, collection and preservation of biological materials, determination of the age and sex of wild animals, sessions on the osteology of mammals and analysis of ecological samples for various parameters. The laboratory staff conducted on-site water quality analysis of the Yamuna River at Okhla Bird Sanctuary for parameters such as DO, EC, pH, turbidity and salinity in shallow and deep water. During the reporting period a total of 1,184 samples were analysed in the laboratory, and of these, 565 were ecological samples to be tested for the following parameters: plant samples (n = 379) for ADF, NDF, lignin, cellulose, nitrogen/crude protein, phosphorus, Ca, Mg, Zn, Cu, Fe, Ni, Mn, Ni, Cr and Pb; soil samples (n = 111) for EC, pH, Cl, CO_3, HCO_3, Ca, Mg, Zn, Cu, Fe, Ni, Mn, Cr, Pb, Na and K; water samples (n = 75) for EC, pH, salinity, TDS, Cl, CO_3, HCO_3, Na, P, K, N, Ca, Mg, Zn, Cu, Fe, Ni, Mn, Ni, Cr and Pb; scat samples (n = 250) of tiger, leopard, jackal, wild dog and sloth bear and herbivore pellet samples (n = 369) of chital, sambar, markhor and goral. The laboratory staff provided technical inputs in various instances, including the demonstration of various traps such as camera traps, mist netting for birds, radio-telemetry and the use of GPS during various training programmes. The laboratory staff also collected meteorological data at the WII campus using a fully automated weather station. During the reporting period, the maximum temperature of 40°C was recorded on May 19, 2010, and the minimum temperature of 4°C was recorded on February 23, 2011. The total rainfall recorded during the year at the WII campus was 2,434.6 mm.

Herbarium

During the reporting period, the herbarium staff surveyed different national parks (NP) and wildlife sanctuaries (WLS), viz. Okhla Bird Sanctuary, Soorsarovar Bird Sanctuary, Patna Bird Sanctuary, Saman Bird Sanctury and the banks of Chambal River in Uttar Pradesh and Keibul Lamjao NP in Manipur, and prepared checklists for all of them. Approximately 900 plant species collected by research scholars and faculty members from various parts of the country (Corbett Tiger Reserve, Rajaji NP, Jhilmil Jheel Conservation Reserve, Parambikulam WLS, Kalakad Mundanthurai WLS and WII campus) and about 50 different seeds and 150 photographs were identified from Panna NP, Parambikulam WLS and Kalakad Mundanthurai WLS for researchers and diploma trainees. Apart from routine work, compilation of the weeds of PAs and digitization of plant specimens are being carried out.

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Wildlife Health Services

Assistance to Rajasthan Forest Department :

Under the NTCA-WII-Rajasthan Forest Department collaborative project on tiger reintroduction, two tigers (one male and one female) were successfully immobilized, collared and translocated to Sariska Tiger Reserve. The male tiger was transported by road to Sariska and released inside the enclosure at Sariska. The animal was finally released from the enclosure on July 27, 2010. Dr. Parag Nigam and Dr. K. Sankar from WII carried out the operation along with Rajasthan Forest Department officials.

The tigress was successfully captured on July 28, 2010 and transported by air. The animal was released in the enclosure at Sariska on the same day and monitored till August 1, 2010. The animal moved out of the enclosure by late evening on August 1, 2010.

Assistance to Madhya Pradesh Forest Department : *Re-introduction of gaur in Bandhavgarh Tiger Reserve, January 21-27, 2011.*

Bandhavgarh Tiger Reserve (BTR) lost its gaur (Bos gaurus gaurus) in 1998, and a plan to repopulate Bandhavgarh with gaur was developed by the Madhya Pradesh Forest Department in collaboration with '& Beyond' (previously called CC Africa). The WII team provided technical assistance with the capture, radio-collaring, sampling, transport and monitoring of gaur. A total of 19 gaur were successfully captured and translocated to BTR during January 21-27, 2011. This represented the first scientific mass translocation of gaur in the country. Dr. Parag Nigam and Dr. K. Sankar provided field inputs.

Emergency services provided to Uttarakhand Forest Department : *Management of wounded wild tusker at Shyampur, May 18, 2010.*

A young adult tusker was reported to be dull and having a deeply infected wound on the thorax. A request for managing the animal was received by

WII. Dr. P. Nigam provided technical assistance. The animal was successfully immobilized. The necessary treatment (local and systemic) was provided to the elephant. The animal was monitored for a week. After the wound healed completely, the animal was seen to be active and apparently healthy in forest thickets.

Management of leopard trapped in a leg hold trap, *January 13, 2011.*

Based on a request from the DFO, Mussoorie, Dr. Parag Nigam proceeded to Govind Nagar Colony, Mussoorie Forest Division (FD) to provide technical assistance for the management of a trapped Leopard. An adult male leopard had accidently strayed into the colony and got trapped in a leg hold trap. Dr. Nigam, along with the FD team, successfully immobilized, rescued and released the leopard in a forest area of Mussoorie FD.

Management of captive tuskers at Chilla camp of Rajaji National Park, *March 29, 2011.*

The tusks of two captive male elephants had become long and were posing a threat to keepers, handlers and tourists. The tusks were successfully trimmed.

Captive Breeding and Zoo Management

The cell provided technical inputs to the Central Zoo Authority, New Delhi relating to evaluation of zoos, conservation breeding programmes and formulation of guidelines for volunteers in zoo management, mobilizing corporate financial support and transportation of wild animals during the reporting period.

Wildlife Policy Research Cell

A core group was constituted from among the faculty, and the group met twice during the year to discuss the way forward for the cell. The group has identified four concerns, on which concept notes are being prepared. These are :

(i) Human-wildlife conflict.

(ii) Tourism in PAs.

(iii) Demographic dynamics and PAs.

(iv) Practicing conservation in field.

Faculty members from the core group were identified for developing concept notes, and it is expected that the notes will be ready in the next year. The concept notes will be elaborated into discussion papers for wider circulation. A discussion paper on 'Invasive Plant Species in the PAs of India' was prepared in February 2011 and circulated among the Governing Body members for comments. The comments are awaited so that the paper can be given its final shape.

Conservation Genetics Laboratory

The mandate of the Conservation Genetics Laboratory is to provide technical services to assist with the conception, analysis and interpretation of field studies, using molecular genetic tools to answer ecological questions. Several Ph.D. students, visiting scientists, postdoctoral researchers and interns work at the lab. Facilities are available at the lab to carry out DNA extraction, PCR amplification and data analyses from a diverse array of samples including faeces, hair, feathers, egg shells, blood and tissue. The lab has successfully standardized low-cost protocols for quick, large-scale DNA extraction from faecal samples that yields highly purified templates for downstream enzymatic reactions.

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The laboratory has been actively engaged in studies on :

(i) Evolutionary relationships among the Indian *(Canis lupus lupus)* and Himalayan wolf *(C. l. chanco)*.

(ii) The population genetics of the endangered great Indian bustard *(Ardeotis nigriceps)*.

(iii) Fine-scale genetic structuring among tiger *(Panthera tigris)* populations in central India.

(iv) Assessment of the phylogeography and genetic structure in the golden jackal *(Canis aureus)*.

(v) In the striped hyena *(Hyaena hyaena)*.

(vi) Evaluating genetic diversity levels in wild and captive sangai deer *(Cervus eldi eldi)*.

(vii) The diversity of avian haematozoan parasite clades in the western Himalaya.

Peer-reviewed papers have been published in leading scientific journals based on the results of many of these studies. Recently, in the first genetic study on the great Indian bustard, the diversity of mitochondrial DNA (hyper variable control region II and cytochrome b gene) in 63 samples from five states was investigated. The diversity was low, being restricted to just three haplotypes defined by three variable sites, with a comparatively low genetic

diversity of π = 0.0021 ± 0.0012 for cytochrome b, 0.0008 ± 0.0007 for the control region and 0.0017 ± 0.0069 for the regions combined and no phylogeographic structure between populations.

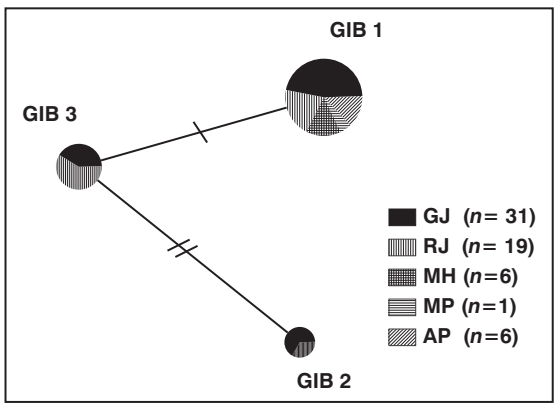

Figure 1. *Median joining network for the three great Indian bustard haplotypes found in all populations. GJ, Gujarat (Kachch); RJ, Rajasthan (Desert National Park); MH, Maharashtra (Nanaj Bustard Sanctuary); MP, Madhya Pradesh (Ghatigaon Bustard Sanctuary); AP, Andhra Pradesh (Rollapadu Wildlife Sanctuary). Size of circle reflects relative frequency. Black dash refers to mutational events.*

Right to Information and Vigilance

Dr. A.K. Bhardwaj, Registrar looked after the responsibility of the CPIO under the Right to Information Act 2005 and undertook the task of the vigilance officer of WII during the reporting period.

Campus Development

Retrofitting work in the Administrative Block; renovation of the old hostel toilet of Block A; repair and maintenance of Type II and Type III quarters; and construction of car/scooter shed for Type III quarters were completed during the year. An electric service connection was provided to the office area and hostel area from the sub-station during the reporting period.

Sports

A tournament was organized by the Indian Council of Forest Research and Education (ICFRE), Dehra Dun in May 2010. Four teams (ICFRE, IGNFA, WII and MoEF) participated in the tournament. The Institute's cricket team was the runner up in this tournament.

VISITORS

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- Students and teachers from Espoo Steiner School, Finland, April 6, 2010.
- Range Forest Officer trainees from Uttarakhand Forest Training Academy, Haldwani, April 7, 2010.
- Scientists and Research Officers of ICFRE, Dehra Dun, undergoing Induction Training at FRI University, April 9, 2010.
- Group of trainees of *Van Aaarakshi* Professional Training session 2010 from Corbett Wildlife Training Centre, Kalagarh (Garhwal), April 13, 2010.
- Students of Vijay Vidyalaya Matriculation High School, Dharmapuri from EDI, Guindy, Chennai, April 16, 2010.
- Participants of *Van Aaarakshi* Prashikshan Course (Uttarakhand) 2010 from NMRC, Sohna, April 20, 2010.
- A group of senior IFS officers (1960-62 Batch) from Indira Gandhi National Forest Academy, Dehra Dun, April 27, 2010.
- M.Sc. (Forestry) students of 2nd Semester from Forest Research Institute Deemed University, Dehra Dun, May 3, 2010.
- Students and a staff member from School of Environmental Biology, APS University, Rewa, May 4, 2010.
- Participants of *Van Aaarakshi* Prashikshan Year 2010 (I Session), from Forest Department, Chakrata, May 10, 2010.
- Students of IX-X Class from Sai Grace Academy, Raipur, Dehra Dun, May 11, 2010.
- Persons of All India Environment Protection Front, Haryana, May 13, 2010.
- Van Daroga trainees, one officer and 5 assistants from Forestry Training Academy, Haldwani (Nainital), May 20, 2010.
- Participants of *Van Aaarakshi* Prashikshan Year 2010 (I Session) from Forest Department, Chakrata, May 21, 2010.
- B. Tech. students from Indian School of Mines, Dhanbad, May 26, 2010.
- RFO trainees from Central Academy for State Forest Service, Burnihat, June 8, 2010.
- Students of IV B.Sc. (Forestry) from Forest College and Research Institute, Mettupalayam, June 9, 2010.
- B.Sc. (Biotechnology) students from Integral University, Kursi Road, Lucknow, June 10, 2010.
- Officers undergoing Higher Command Management Course at SSB Academy, Srinagar Garhwal, June 22, 2010.
- Trainees from Central Academy for State Forest Service Academy, Dehra Dun on July 7, 2010.
- Trainees (2010-2012 session) from Central Academy for State Forest Service Academy, Dehra Dun on July 8, 2010.
- Trainees from Central Academy for State Forest Service Academy, Dehra Dun on July 28, 2010.
- Cadets accompanied by masters from RIMC, Garhi Cantt, Dehra Dun on July 30, 2010.
- A group of P.G. Diploma and M. Tech Officer trainees (2010-11 batch) accompanied by Dr. S. Nandy, Scientist `SC' from the Indian Institute of Remote Sensing, Dehra Dun on August 13, 2010.
- A group of 24 in-service SFS Officers undergoing a training workshop on Wildlife Management from SFS College, Dehra Dun on September 8, 2010.
- A group of trainees of Foresters Training Course (2010-11) and Uttarakhand Forest Guards Training Course (3rd Batch) accompanied by their two instructors from Training Circule, Haryana, Pinjore on September 27, 2010.
- IFS Officers of Professional Skill Up-Gradation Course for IFS Officers at IGNFA, Dehra Dun on October 4, 2010.
- Research scholars of Biotechnology

accompanied by faculty from FRI, Dehra Dun on October 4, 2010.

- A group of retired forest officials from Aranyak Paryavaran Sanskrit Kendra-Bharat, Ahmedabad on October 18, 2010.
- Students accompanied by teachers from CARMAN School, Shyampur, Premnagar, Dehra Dun on October 21, 2010.
- Students of B.V.Sc. & A.H. from College of Veterinary Science & A.H., Jabalpur on October 21, 2010.
- Forest Guard Trainees (Female) from Forestry Training Academy, Haldwani, Nainital on October 25, 2010.
- Trainees of Forester Training Course 2010-11 at FTI Pinjore and Forest Guard Training Course, Uttarakhand at NRMC Sohna, Haryana accompanied by instructors on October 25, 2010.
- FROs on study tour from Forestry Training Academy, Haldwani, Nainital on October 25, 2010.
- Forest Guards accompanied by faculty from P.V.P.K. Jaintee, Almora on October 27, 2010.
- Students from University of Agricultural Sciences, Bangalore, Sericulture College of, Chintamani on Oct. 28, 2010.
- B.Sc. students from St. Xavier's College of Arts, Science & Commerce, Mapusa Bardez, Goa on November 11, 2010.
- ACFs of Uttarakhand FD undergoing 3-week Orientation Course at CASFS, Dehra Dun on November 11, 2010.
- Officers undergoing promotional course for Asstt. Commandants at SSB Academy, Srinagar Garhwal along with one officer (Instructor) on November 12, 2010.
- Students accompanied by teachers from U.W. School, Dehra Dun on November 12, 2010.
- DHJS Officers of the Delhi High Judicial Service (on Educational-cum-Excursion Trip) from Delhi Judicial Academy, Karkardooma Court Complex, Shahdara, Delhi on November 13, 2010.
- Forests Guards from Corbett Wildlife Training Centre, Kalagarh on November 15, 2010.
- Students of IV B.Sc. (Forestry) from Tamil Nadu Agricultural University, Mettupalayam on November 16, 2010.
- IFS officers attending a training workshop at IGNFA) from TERI University, New Delhi on November 19, 2010.
- B.Sc. (3rd Year) students from Tribhuvan University, Pokhra Campus, Nepal on November 23, 2010.
- B.Sc. students accompanied by two staff from Kathmandu Forestry College on November 23, 2010.
- Forest Range Officer Trainees from Central Academy for State Forest Service, Coimbatore on November 29, 2010.
- M.Sc. Biotechnology and M.Sc. Biomedical Science students from Dolphin (P.G.) Institute of Bio-Medical & Natural Sciences Manduwala, Dehra Dun on December 1, 2010.
- Officer Trainees and faculty from CA for SFS, Dehra Dun on December 2, 2010.
- Students from GRD Academy, Dehra Dun on December 6, 2010.
- B.Sc. Forestry students from Tribhuvan University, Hetauda Campus, Narayani Anchal, Nepal on December 6, 2010.
- Two UN CSST E-AP P.G. Diploma Course Officer trainees of 2010-11 batch from Indian Institute of Remote Sensing, Dehra Dun on December 14, 2010.
- Students from Indian Institute of Forest Management, Bhopal, M.P. on December 15, 2010.

- IFS Officer Trainees from Indira Gandhi National Forest Academy, Dehra Dun on December 15, 2010.
- Students of Forest Management from Indian Institute of Forest Management, Bhopal on December 21, 2010.
- A group of six officers undergoing the Senior/Higher Command Management Course from SSB Academy, Srinagar Garhwal on December 21, 2010.
- Students of M.Sc. Botany from S.M. P.G. College, Chandausi, Moradabad on December 22, 2010.
- Students of Forestry from N.E.R. Institute of Science & Technology, Nirjula, Arunachal Pradesh on December 22, 2010.
- Students of Forest Management from Indian Institute of Forest Management, Bhopal on December 24, 2010.
- A group of 50 students of Jain Heritage and Cambridge School (Hyderabad & Nagpur branch) on December 28, 2010.
- B.Sc. (Forestry) III year students accompanied by their faculty and staff personnel from Govt. Degree College (under Osmnia University), Kamareddy, Andhra Pradesh on January 28, 2011.
- Cadets accompanied by two masters from RIMC, Garhi Cantt, Dehra Dun on February 1, 2011.
- Final year B.V.Sc. & AH students accompanied by their faculty and staff from Karnataka State, Karnataka Animal Fishers & Science University (KAFSU), BIDAR on February 7, 2011.
- A group of participants of the 3-Week Orientation Course for ACFs of Uttarakhand Forest Department from Central Academy for State Forest Service, Dehra Dun on February 18, 2011.
- B.Sc. (Forestry) students accompanied by three teachers from Sam Higginbottom Institute of Agriculture, Technology and Sciences, Allahabad on March 3, 2011.
- B.Sc. (Forestry) students of VIII Semester accompanied by their two teachers and staff personnel from ASPEE College of Horticulture & Forestry, Navsari Agricultural University, Navsari on March 4, 2011.
- M.Sc. (Geoinformatics) students accompanied by their faculty from TERI University, New Delhi on March 11, 2011.
- Women Trainee accompanied by one officer and five staff from Uttarakhand Forestry Training Academy, Haldwani on March 28, 2011.

GOVERNANCE

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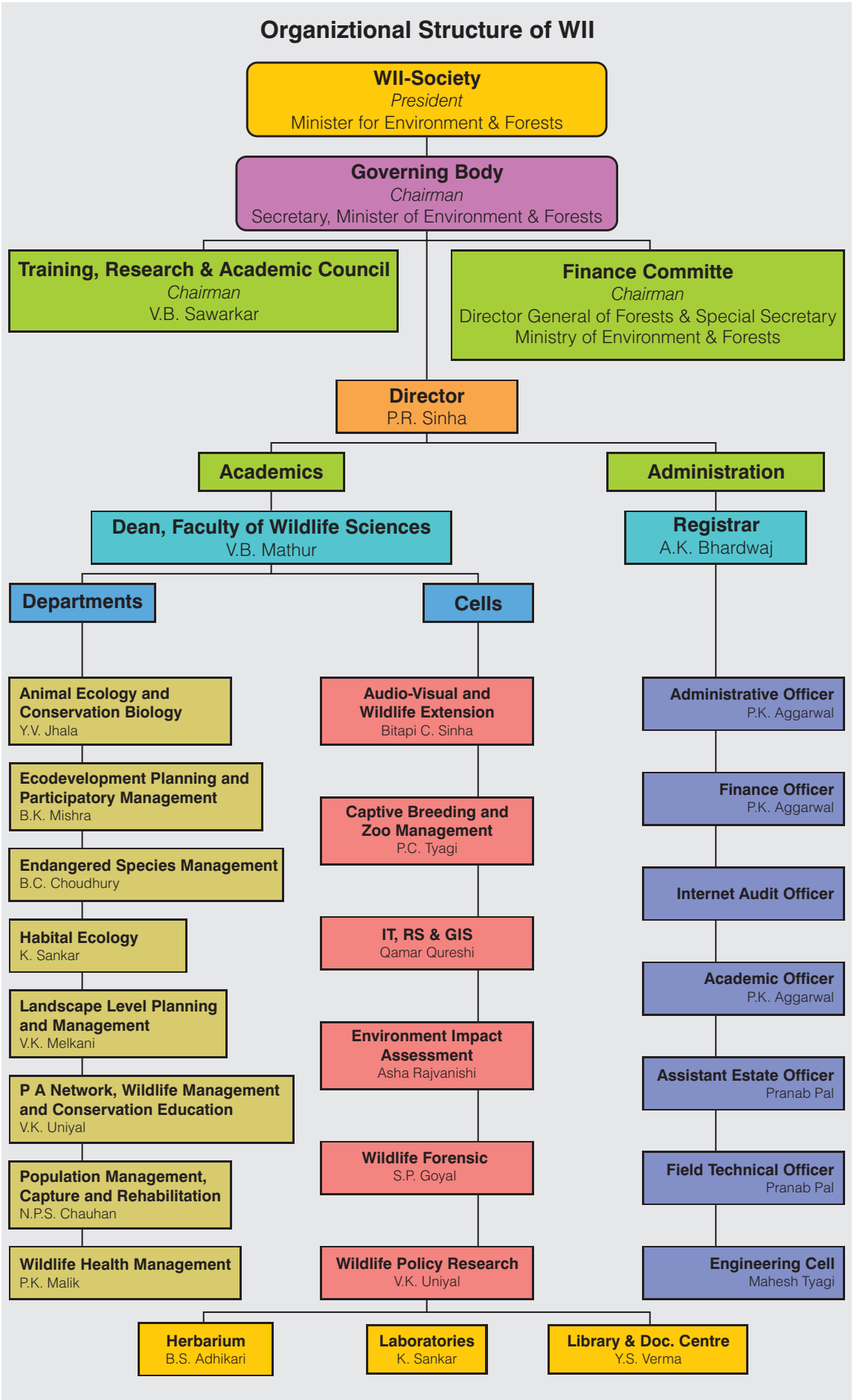
- ORGANISATIONAL STRUCTURE OF WII
- WII-SOCIETY
- GOVERNING BODY
- TRAC
- FINANCE COMMITTEE
- BUILDING COMMITTEE

Organiztional 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, Dehra Dun.
(iv) Centre for Environment Education, Ahmedabad.
(v) Prakriti Samsad, Kolkatta**

Members *(Ex-officio)*

30. **Secretary to Government of India**
    Ministry of Environment & Forests,
    Paryavaran Bhavan, '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"
    Dehra Dun - 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,
Dehra Dun
(Faculty representative of WII)

44. **Dr. V.K. Melkani****
Scientist-F,
Wildlife Institute of India, Dehra Dun
(Faculty representative of WII)

Member Secretary

45. **Director,**
Wildlife Institute of India,
Dehra Dun

Permanent Invitee

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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,
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New Delhi 110 003

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10. **Chief Secretary,**
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11-16. Chief Wildlife Warden on a regional rotational basis

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Southern Region - Karnataka
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Member

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Wildlife Institute of India,
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Dehra Dun - 248 001
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21. Director,
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Post Box 18, Chandrabani,
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National Tiger Conservation Authority,
Bikaner House, Shahjahan Marg,
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24. Director (Project Elephant),
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Central India - Uttar Pradesh
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Southern Region - Andhra Pradesh, Karnataka
North-eastern Region - Sikkim, Meghalaya & Nagaland
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Kolkata 700 064 (W.B.)

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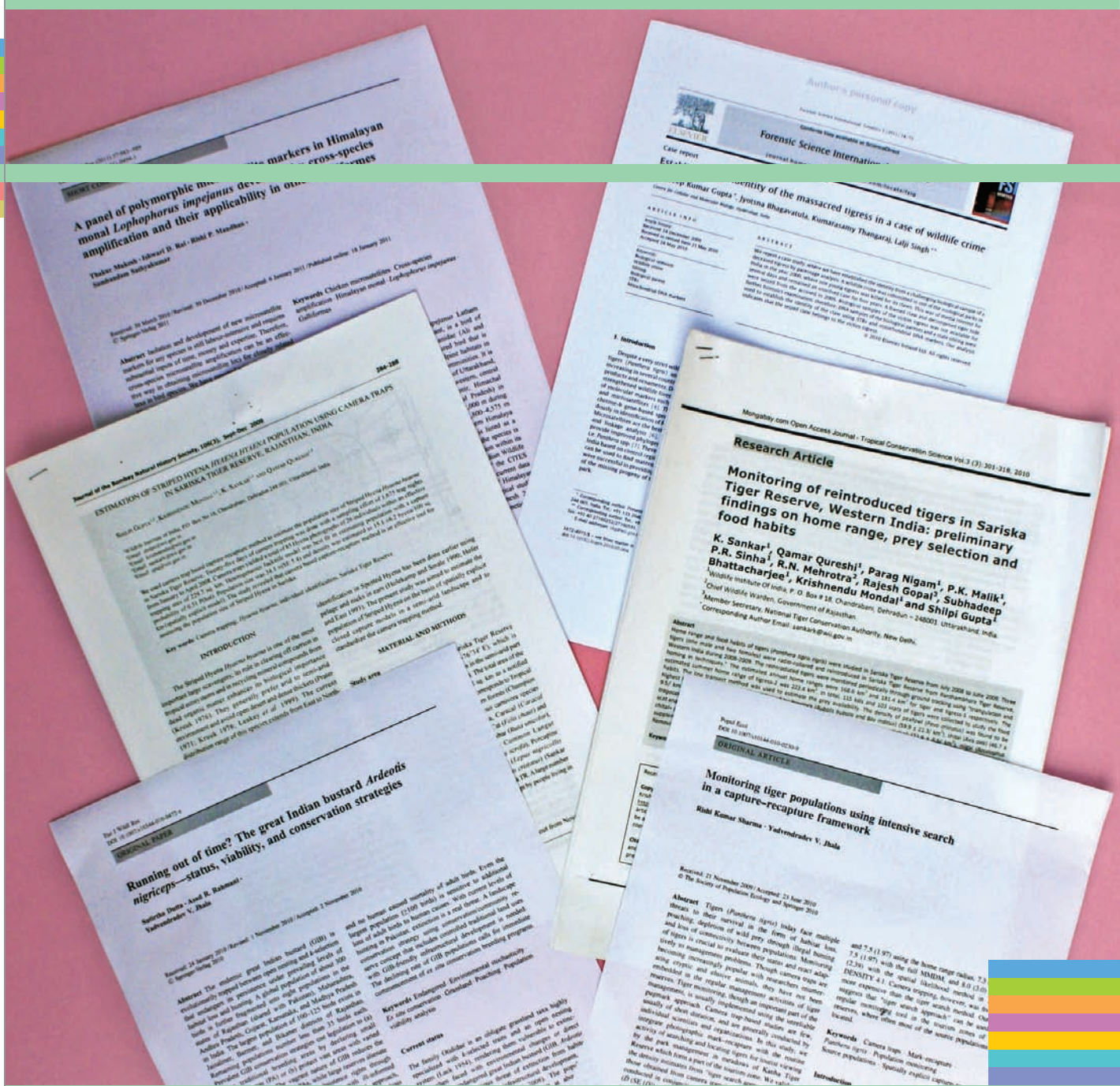
PUBLICATIONS



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- PAPERS PRESENTED
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(i) Status of Tigers in India.

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Uniyal, V.P. 2010. **Biodiversity monitoring through bioindicators in protected areas.** Department of Higher Education Haryana, at D.A.V. College Ambala City, Haryana.

Popular Articles

John, S., Kumar, R.S., Choudhury, B.C. and Sivakumar, K. 2010. **Observations of juvenile green and hawksbill turtles along the southern Orissa coast, India.** Indian Ocean Turtle Newsletter No. 12: 9-12.

Mondal, K., Sankar, K. and Qureshi, Q. 2010. **A spot of trouble.** Sanctuary Asia. Vol.XXX No. 4. August. Pp 36 to 39.

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Talk

Jhala, Y.V. 2011. **M-STrIPES.** Zoological Society of London, UK, June 22-25, 2011.

TALKS & MEETINGS

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- WII FACULTY AS RESOURCE SPEAKERS
- RESOURCE SPEAKERS AT WII

From WII

Teaching inputs provided to other institutions

Shri S.K. Gupta (April 3, 2010) : **Control of wildlife crime and conservation genetics.** A lecture series on Biotechnology ("BioLOGIC" 10) at AMN Ghosh Auditorium ONGC, Dehra Dun.

Dr. P.K. Mathur (April 7, 2010) : **Biodiversity conservation - challenges and prospects.** The 10-week Induction Training for Scientists & Research Officers of ICFRE.

Dr. S. Sathyakumar (April 2010) : **Project snow leopard.** IFS Probationers at the Indira Gandhi National Forest Academy, Dehra Dun.

Dr. R. Badola (April 6, 2010) : **Joint and participatory forest management.** Induction trainees, scientists and ROs of Indian Council of Forestry Research & Education, Dehra Dun.

Dr. G. Talukdar (April 11-16, 2010) : **Field data collection and data entry software.** Monitoring Tigers, Co-Predators, Prey and Habitat, Forest Department, Mollem, Goa.

Dr. R. Badola (May 5-7, 2010) : **Human resources development (leadership and conflict management).** Officer trainees of professional induction course (2008-10, 2009-11). Central Academy for State Forest Service, Dehra Dun.

Dr. B.K. Mishra (May 6, 2010) : **'Importance of team building' and 'Conflicts and conflict resolution mechanisms'.** Regular course for SFS probationer at Central Academy for State Forest Services, Dehra Dun.

Dr. Parag Nigam (May 10, 2010) : **Immobilization and restraint of wild animals.** Lecture cum demonstration for the 2008-10 Batch of trainees at Central Academy for State Forest Service, Dehra Dun.

Dr. Asha Rajvanshi (June 3, 2010) : **Environmental Impact Assessment and application of remote sensing techniques in prediction and mitigation of impacts.** Indian Institute of Remote Sensing (IIRS), Dehra Dun.

Dr. R. Badola (June 4, 2010) : **Ecodevelopment planning in India.** Participants of NNRMS course. Indian Institute of Remote Sensing, Dehra Dun.

Shri G.S. Bhardwaj (June 5, 2010) : **Wildlife photography.** G.B. Pant Institute of Himalayan Environment & Development, Almora.

Dr. G. Talukdar (June 6-9, 2010) : **Applications of remote sensing & GIS in forestry.** Guest Lecture for M.Sc. in Remote Sensing & GIS, Jiwaji University, Gwalior.

Dr. Y.V. Jhala (June 14, 2010) : **The challenge of tiger conservation in India.** Talk at the National Zoological Park, Smithsonian Institution, Washington DC.

Dr. Asha Rajvanshi (June 28, 2010) : **Environment Impact Assessment (EIA) Module.** Indira Gandhi National Forest Academy, Dehra Dun.

Dr. R. Badola (July 7, 2010) : **Environmental economics.** 2010-2012 batch of SFS officer trainees Central Academy for State Forest Service, Dehra Dun.

Dr. A.K. Bhardwaj (July 14, 2010) : **Ecodevelopment initiatives in India.** Central Academy for State Forest Service, Dehra Dun.

Shri P.C. Tyagi (July 15-16, 2010) : **Cilviculture.** Cilviculture viva voce of 2008-10 batch at Indira Gandhi National Forest Academy, Dehra Dun.

Dr. R. Badola (July 19, 2010) : **Introduction to environmental economics.** Officer trainees of IFS In-service course at Indira Gandhi National Forest Academy, Dehra Dun.

Dr. R. Badola (July 21-23, 2010) : **Conducted the module on ecodevelopment.** IFS probationers of the 2009-11 Course at Indira Gandhi National Forest Academy, Dehra Dun.

Dr. Asha Rajvanshi (July 23, 2010) : **Relevance of biodiversity conservation for human well being and the role of impact assessment.** Lecture for the students of M.Sc. Environmental Studies and M.Sc. Natural Resources Management at Doon University.

Dr. A.K. Bhardwaj (July 27, 2010) : **Role of participatory management in wildlife conservation.** Central Academy for State Forest Service, Dehra Dun.

Dr. S.A. Hussain (July 28, 2010) : **Wetland conservation and management.** Two weeks refresher course for SFS Officers at SFS College, Dehra Dun.

Dr. Asha Rajvanshi (July 29, 2010) : **Why conserve biodiversity.** Training course organized by Doon University-School of Environment & Natural Resources - Brainstorming Workshop on Executive Certificate Courses on Environmental Impact Assessment (EIA), Dehra Dun.

Dr. R. Badola (July 30, 2010) : **Motivation.** Officer trainees of two weeks general refresher for In-service SFS officers, Central Academy for State Forest Service, Dehra Dun.

Dr. A.K. Bhardwaj (July 30, 2010) : **Environment, biodiversity conservation and livelihood security.** School of Environment and National Resources, Doon University, Dehra Dun.

Dr. Parag Nigam (August 3-5, 2010) : **Various aspects of wildlife health management.** Eight lectures for the 2009-11 IFS probationers at Indira Gandhi National Forest Academy, Dehra Dun.

Dr. A.K. Bhardwaj (August 17, 2010) : **Leadership and motivation issues in forestry.** Central Academy for State Forest Service, Dehra Dun.

Dr. V.B. Mathur (August 17, 2010). **Protected Areas in India**. P.G. Diploma/ M.Tech. Training Course at IIRS, Dehradun.

Dr. R. Badola (August 19, 2010) : **Motivation issues in forestry and communication skills.** Officer trainees of training-cum-workshop for in-service SFS officers, Central Academy for State Forest Service, Dehra Dun.

Dr. Asha Rajvanshi (September 2, 2010): **Understanding EIA : From Screening to Decision-Making.** Training course organized by the Centre for Science and Environment, New Delhi.

Dr. V.P. Uniyal (September 5, 2010) : **Role of pollinators in agro ecosystem.** Organic farming Workshop at Navdanya, Dehra Dun.

Shri P.C. Tyagi (September 9, 2010) : ***Ex-situ* conservation.** Wildlife Management for in-Service SFS Officers at Central Academy for State Forest Service Officers, Dehra Dun.

Shri G.S. Bhardwaj (September, 2010) : **Man-animal conflict.** Lal Bahadur Shastri National Academy of Administration, Mussoorie.

Shri G.S. Bhardwaj (September, 2010) : **Man-animal conflict.** MCT Phase III, Indira Gandhi National Forest Academy, Dehra Dun.

Shri G.S. Bhardwaj (September, 2010) : **Man-animal conflict.** MCT Phase IV, Indira Gandhi National Forest Academy, Dehra Dun.

Dr. Parag Nigam (October 13, 2010) : **Understanding wildlife health management.** Guest lecturer was delivered to the officers of the professional skill up-gradation course (inducted IFS officers) at Indira Gandhi National Forest Academy, Dehra Dun.

Shri Gopi G.V. (October 20-26, 2010) : **Wildlife techniques tour at Sariska.** Indira Gandhi National Forest Academy, Dehra Dun.

Dr. S. Sathyakumar (October 2010) : **Wildlife of the Himalaya - Conservation through science.** As the Chief Guest at the Forest Research Institute Deemed University on the eve of "Gyps 2010" Wildlife Week Celebrations.

Dr. Parag Nigam (November 10, 2010): **Management of wild animals in distress.** 3- week orientation course for ACFs of Uttarakhand Forest Department was organized by the Central Academy for State Forest Service, Dehra Dun during November 8-25, 2010.

Dr. A.K. Bhardwaj (November 11, 2010): **Project formulation and implementation for biodiversity conservation.** Central Academy for State Forest Service, Dehra Dun.

Shri P.C. Tyagi (November 11, 2010) : **Captive Management.** Orientation course for ACF at Indira Gandhi National Forest Academy, Dehra Dun.

Shri G.S. Bhardwaj (November 11, 2010) : **Man-animal conflict issues.** Central Academy for States Forest Service, Dehra Dun.

Dr. R. Badola (November 11, 2010) : **Ecosystem services for human well being.** Officer trainees of the 85th Foundation Course, Lal Bahadur Shastri National Academy of Administration, Mussoorie.

Dr. Sushant Chowdhury (November 12, 2010) : **Dimensions of human-wildlife conflicts.** DST Supported National Level Training Program for Scientist and Technologists: One week training workshop.

Dr. Sushant Chowdhury (November 12, 2010) : **The role and expectation of scientists in addressing biodiversity issues.** View point presented for panel discussion organized for DST Supported National

Level Training Program for Scientist and Technologists: One week training workshop.

Dr. A.K. Bhardwaj (November 16, 2010) : **Forest and wildlife management in south India.** TERI University.

Shri S.K. Gupta (November 25, 2010) : **Control of illegal wildlife trade.** Orientation Course for ACF of Uttarakhand at Central Academy for State Forest Service (CASFS), Dehra Dun.

Dr. A.K. Bhardwaj (November 26, 2010) : **Ecodevelopment planning.** Indian Institute of Remote Sensing, Dehra Dun.

Dr. S. Sathyakumar (November 2010) : **Wildlife of the Himalaya - Issues and challenges.** Officers of the MCT Course organized by TERI and Indira Gandhi National Forest Academy, Dehra Dun.

Dr. S.A. Hussain (December 1, 2010) : **Wetland management.** Two weeks refresher course for SFS Officers at SFS College, Dehra Dun.

Shri G.S. Bhardwaj (December 2, 2010) : **Man-animal conflict issues.** Central Academy for States Forest Service, Dehra Dun.

Dr. A.K. Bhardwaj (December 3, 2010) : **Project formulation for biodiversity conservation.** Central Academy for State Forest Service, Dehra Dun.

Dr. R. Badola (December 3, 2010) : **Project formulation and implementation.** Officer trainees of two weeks general refresher for in-service SFS officers at Central Academy for State Forest Service, Dehra Dun.

Dr. Sushant Chowdhury (December 7, 2010): **Human-wildlife conflict and their mitigation with special reference to Orissa.** Lecture provided for IInd Media Workshop at Bhubaneswar.

Dr. Sushant Chowdhury (January 1, 2011) : **Elephant conservation and human-elephant conflicts.** Lecture provided for visiting North Carolina State University students.

Shri G.S. Bhardwaj (January 4, 2011) : **Techniques of nature photography.** Indira Gandhi National Forest Academy, Dehra Dun.

Dr. S.A. Hussain (January 6, 2010) : **Management of mangrove forests for ecosystem services.** MCT Course at Indira Gandhi National Forest Academy, Dehra Dun.

Shri Gopi G.V. (January 18-19, 2011) : **Biology, conservation and management of waterbirds, sea turtles and wetlands.** Forest Research Institute, Dehra Dun.

Shri Gopi G.V. (January 18-February 5, 2011) : **Waterbird conservation and Asan Conservation Reserve.** Indian Revenue Service (Customs and Excise).

Dr. V.P. Uniyal (January 22, 2011) : **Bioindicators on climate change.** DAV College, Ambala City.

Dr. K. Vasudevan (January 24 -February 7, 2011): **Herpetology.** DST SERC School in Herpetology at Salim Ali Centre for Ornithology, Coimbatore.

Dr. G. Talukdar (January 28-February 3, 2011): **Distribution modeling and applications of RS/GIS in Herpetology.** 4th DST-SERC School in Herpetology, Coimbatore, DST.

Dr. R. Badola (January 31-February 4, 2011): **Ecodevelopment.** M.Sc. Forestry-IV Semester, (Wildlife Management and Ecodevelopment), at Forest Research Institute Deemed University, Dehra Dun.

Dr. R. Badola (January, 2011) : **Micro-planning tools and techniques.** Students of Postmasters Diploma in Natural Resources Management 2nd semester at Forest Research Institute Deemed University, Dehra Dun.

Dr. V.B. Mathur (February 2, 2011). **Environmental Policy Framework: Global and Natural Perspectives.** IFS-MCT Phase-III Training Programme at IGNFA, Dehradun.

Dr. V.B. Mathur (February 3, 2011). **EIA of Narmada Sagar Project: Lessons Learnt.** IFS-MCT Phase-III Training Programme at IGNFA, Dehradun.

Dr. Asha Rajvanshi (February 7-8, 2011): Environmental Impact Assessment (EIA), Valuation and Mitigation. **Indira Gandhi National Forest Academy, Dehra Dun.**

Dr. V.B. Mathur (February 8, 2011). **Strategic Environment Assessment (SEA): A tool for Integrated Sustainability Appraisal**. IFS-MCT Phase-III Training Programme at IGNFA, Dehradun.

Dr. V.P. Uniyal (February 10, 2011): **Biodiversity and protected area management in western Himalaya.** Haryana State Science Conference, Kurukshetra University, Haryana.

Dr. B.K. Mishra (February 10, 2011) : **Interface resource conflict and strategies for conserving biodiversity.** PG Diploma Course in Natural Resource Management at Forest Research Institute Deemed University, Dehra Dun.

Dr. B.K. Mishra (February 11, 2011) : **Conflicts in natural resource management and conflict resolution mechanisms.** M.Sc. Forestry Course at Forest Research Institute Deemed University, Dehra Dun.

Dr. Parag Nigam (February 12, 2011) : **Relevance of proper sampling in wildlife crime investigation.**

Workshop on Forest and Wildlife Crime-Detection, Investigation and Prosecution was organized by Tiger Trust and Rajasthan Forest Department during February 11-13, 2011. A field demonstration of immobilization, biological sampling, labeling, packaging and report writing was carried out at Sariska Tiger Reserve.

Dr. B.K. Mishra (February 13, 2011) : **Interface resource conflict and strategies for conserving biodiversity.** PG Diploma Course in Natural Resource Management at Forest Research Institute Deemed University, Dehra Dun.

Shri S.K. Gupta (February 18, 2011) : **Control of illegal wildlife trade.** Orientation Course for ACF of Uttarakand at Central Academy for State Forest Service (CASFS), Dehra Dun.

Dr. Asha Rajvanshi (February 19, 2011) : **Solar PV power plants and impacts on ecology.** Short-term technical courses for professionals under Continuing Professional Development Programmes (CPDPs) at Engineering Staff College of India (ESCI), Hyderabad.

Dr. Parag Nigam (February 21-22, 2011) : **Management of wild animals in distress, rescue and rehabilitation, human safety consideration and immobilization equipments and drugs.** Advance training program on Wildlife Health, Disease Management and Preservation was organized by Maharashtra Animal Husbandry Department for field veterinarians at VANAMATI, Nagpur, February 21-26, 2011.

Dr. B.S. Adhikari (February 24, 2011) : **Himalayan biodiversity and climate change.** Undergraduate, Graduate and Research Scholars at Department of Environmental Science, Kurukshetra University, Kurukshetra.

Dr. V.P. Uniyal (February 26, 2011) : **Biodiversity of western Himalayan protected areas.** Hindu Girls College, Jagadhari, Haryana.

Dr. R. Badola (February 28, 2011) : **Project formulation and implementation.** Officer trainees of three weeks orientation course for ACFs of Uttarakhand Forest Department (2008-10, 2009-11) at Central Academy for State Forest Service, Dehra Dun.

Dr. A.K. Bhardwaj (February 28, 2011) : **Project formulation and implementation for biodiversity conservation.** Central Academy for State Forest Service, Dehra Dun.

Dr. V.P. Uniyal (February 28, 2011) : **Stakeholders from Garhwal region on Himalayan pollinators.** Navdanya, Dehra Dun.

Dr. V.P. Uniyal (March 1, 2011) : **Monitoring in protected areas of western Himalayan region.** Staff College Refresher programme for college teachers at Kurukshetra University, Haryana.

Shri G.S. Bhardwaj (March 10, 2011) : **Tiger conservation issues and challenges.** Indira Gandhi National Forest Academy, Dehra Dun.

Dr. K. Vasudevan (March 14-18, 2011) : **Gene to ecosystem level diversity; Global biogeographic classification; Hotspots of biodiversity; Endemism; Concept of umbrella, flagship, keystone and indicator species.** IFS Probationers Foundation Course at Indira Gandhi National Forest Academy, Dehra Dun.

Dr. R. Badola (March 15, 2011) : **REDD and REDD plus.** Participants from African member countries of the India-Africa forum sponsored by the Ministry of External Affairs GoI, for the training programme on Combating desertification and climate change at Central Academy for State Forest Service, Dehra Dun.

Dr. R. Badola (March 22-23, 2011) : **Project Formulation and Implementation.** Probationers of 2009-2011 batch of SFS, at Central Academy for State Forest Service, Dehra Dun.

Resource Speakers at WII

- **Dr. John and Dr. Ager** (April 1-2, 2010). **Lecture delivered to the officer trainees of the P.G. Diploma in Wildlife Management.**
- **Dr. K. Praveen Karanth,** Assistant Professor, Centre for Ecological Sciences, Indian Institute of Science, Bangalore (May 11-12, 2010). **Gondwanan relicts and out of India hypothesis.**
- **Dr. Dieter Thomas Tietze,** post doctoral fellow University of Chicago (June 10, 2010). **Song bird diversity in Himalayas.**
- **Prof. Dr. Dianne Brunton,** Ecology & Conservation Group, Institute for Natural Sciences, Massey University, Auckland, New Zealand (August 17, 2010). **Islands and conservation: Exploring outcomes using New Zealand examples.**
- **Prof. Barry R. Noon,** Department of Fish, Wildlife, and Conservation Biology, Colorado State University, Fort Collins, USA (August 27, 2010). **Efficient species-level monitoring at the landscape scale.**
- **Prof. G. Agoramoorthy,** Tajen University, Taiwan (September 3, 2010).
  (i) Zoo animal welfare, primate rehabilitation and release.
  (ii) **Human-animal conflict :** the issue of monkey menace.

- Shri H.S. Panwar, Former Director, WII (September 17, 2010). Lessons from Panna Tiger reserve for tiger conservation in India.
- Dr. A.J.T. Johnsingh (September 17, 2010). An over view of India's wilderness.
- Dr. S. Srikumaran, Professor, and Rocky Crate-FNAWS Endowed Chair, Department of Veterinary Microbiology and Pathology, College of Veterinary Medicine, Washington State University, Pullman, WA 99164-7040, USA, (November 29-December 10, 2010). Meetings with faculty members and guest lecture.
- Drs. Geraldine Veron and Andy Jenings from Museum National d'Histoire Naturelle, Department Systematique et Evolution, Origine, Structure et Evolution de la Biodiversite, 57 Rue Cuvier, 75231 PARIS Cedex 05 FRANCE (October 25-26, 2010). Systematics and conservation of Asian civets and mongooses.
- Dr. S. Srikumaran, Professor, and Rocky Crate-FNA Endowed Chair, Department of Veterinary Microbiology and Pathology, College of Veterinary Medicine, Washington State University, USA, (December 1-2, 2010).
  (i) General information on bighorn sheep and methods used to capture them.
  (ii) Disease transmission from domestic sheep to bighorn sheep and our attempts to prevent it.
- Shri R.K. Upadhyay (December 29, 2010). Provisions of CrPC, IPC and Money Laundering in forest & wildlife offenses.
- Dr. Rick Scherer (March 22-23, 2011).
  (i) Occupancy Models and the Status of Amphibians in Rocky Mountain National Park.
  (ii) The Effects of the Amphibian Chytrid Fungus and the Demography Boreal Toads in Colorado.

Awards

Dr. Bilal Habib

Dr. Bilal Habib's presentation was adjudged as the best oral presentation during the technical session on 'Studies of Mammals and Birds for the presentation Predation Dynamics of Wolves in Semi-wild Landscapes of Deccan Plateau, Maharashtra, India' in International Conference on "Wildlife and Biodiversity Conservation vis-à-vis Climate Change" from June 3-5, 2010.

Dr. Parag Nigam

Dr. Parag Nigam received award of excellence from the Uttarakhand Forest Department for the contributions made towards Forest & Wildlife Conservation in Uttarakhand. The award was presented by Dr. R.B.S Rawat, PCCF, Uttarakhand during the wildlife week celebrations held at Manthan Bhawan, Dehra Dun on October 1, 2010.

Abesh Sanyal

Paper Presentation on Diversity, distribution pattern and seasonal variation in moth assemblages along altitudinal gradient in Gangotri Landscape area, Western Himalaya, Uttarakhand at 3rd Asian Lepidoptera Conservation Symposium and training Programme. South Asian Invertebrate Specialist Group IUCN SSC Zoo Outreach Organisation Coimbatore.

Shazia Quasin

Young Arachnologist award on Spider diversity along altitudinal gradient: Study in Nanda Devi Biosphere Reserve, Western Himalaya, India at National workshop on Arachnology with reference to Spiders in Amravati University, Maharashtra.

V. Deepak

Shri V. Deepak, Senior Research Fellow engaged in the project "Ecology of endemic turtles of India" attended the 8th Annual Symposium on the Conservation and Biology of Tortoises and Freshwater Turtles held in August 16-19, 2010 in Orlando, Florida, USA, with funding support from Turtle Survival Alliance. He made one oral and one poster presentation at the conference, and his oral presentation received an award in 'Biology' category.

ACCOUNTS

© V. Deepak

SEPARATE AUDIT REPORT OF THE COMPTROLLER AND AUDITOR GENERAL OF INDIA ON THE ACCOUNTS OF WILDLIFE INSTITUTE OF INDIA FOR THE YEAR ENDED 31ST MARCH 2011.

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 2011.

1. We have audited the attached Balance Sheet of Wildlife Institute of India, Dehradun (WII) as on 31 March 2011, the Income & Expenditure Account and the Receipt & Payment Account for the year ended on that date under Section 19(2) of the Comproller and Auditor General's (Duties, Power & Conditions of Service) Act, 1971 read with Section (38g) of the Wildlife Institute of India (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. This Separate Audit Report contains the comment 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 aspect, etc, if any, are reported through Inspection Reports/CAG's Audit Report 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 mis-statements. 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 audit:

(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 Receipts & Payments 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, 1 972 in so for as it appears from our examination of such books.

(iv) We further report that:

Comments on Accounts

A) Balance Sheet

1. An amount of ₹ 24.50 lakhs has been shown as Advances outstanding of CPWD instead of outstanding advances of ₹ 40.97 Lakhs resulting in Understatement of Schedule 11 B "Loan, Advance & Other Assets" by ₹ 16.47 lakhs and overstatement of Schedule 8 Fixed Assets Campus Development by ₹ 16.47.

2. Tax deducted at sources (TDS) of ₹ 8.08 lakhs deducted by the bank has not been accounted. This has resulted in overstatement of deficit as well as understatement of Current Assets by ₹ 8.08 lakhs under schedule - 11 B - Advances and other amounts recoverable in cash-TDS and understatement of corpus/capital fund.

3. The expenditure of ₹ 3.09 lakhs incurred for three training courses/workshops conducted during 2009-11 which is recoverable from the sponsors (MoEF) have not been shown as recoverable resulting in overstatement of deficit as well as understatement of Current Assets by ₹ 3.09 lakhs and understatement of corpus/capital fund.

4. Books worth ₹ 2.32 lakhs purchased under Consultancy Projects was not shown as Fixed

Assets resulting in Overstatement of revenue expenditure and Understatement of Fixed Assets and Capital Fund expenditure in Schedule 3 "Earmarked Funds".

5. An expenditure of ₹ 8.38 lakhs incurred out of Grant-in-Aid for seven training courses/ workshops conducted between 1996-97 to 2005-06 is still recoverable from the sponsors/participants. Similarly, journals amounting to ₹ 1.09 lakhs were not received for which advance payments were made during 1986-91 to 2008-09. Action may be initiated for recovery of these outstanding payments/ journals.

6. The closing balance of fixed assets including "Material and Supplies" valuing ₹ 15.02 lakhs (after depreciation) which was non existent in stock. The stock register for the item was not maintained. The items had been carried over in the Balance Sheet since 2002-03 and the same was being depreciated. The Institute stated (September 2011) that the items booked under "Material and Supplies" since 1986-87 are not cement & steel but items of consumable and non-consumable nature. Since 1986-87 to 2003-04 total items amounting to ₹ 38.75 lakhs had been purchased and booked under this head and depreciation of ₹ 23.73 lakhs had been charged up to 31-03-2011. This resulted in overstatement of Assets, Schedule -8 by ₹ 15.02 lakhs and depreciation of ₹ 23.73 lakhs charged till 31-03-2011 may be written off.

B) Grant in Aid

The Institute received ₹ 1670 lakhs as Grant in Aid during 2010-11 (₹ Nil received in March 2011) 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 Wildlife Institute of India, 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 Wildlife Institute of India, Dehradun as at 31st March 2011; 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

Geetali Tare

Principal Director of Audit (SD)

Place : New Delhi
Date : 25-11-11

Annexure

1. **Adequacy of Internal Audit System:** Internal audit of WII has been conducted for the first time since inception during 2010-11 by APO, MOEF. The Internal Adudit System is adequate.
2. **System of Physical Verification of Assets:** The physical verification system is not in existence since 2006-07.
3. **System of Physical Verification of Inventory:** Inventory of Plantation costing ₹ 34.38 lakhs and Trees ₹ 24.33 lakhs has not been maintained.
4. **Adequacy of Internal Control System:** The Internal Control System is adequate.
5. **Regularity in payment of statutory dues:** WII was generally regular in payment of undisputed statutory dues except in some cases not involving significant amount.
6. **Maintenance of Asset Register:** The Asset Register is not complete and to that extent the actual number of particular type of asset available at the end of 31.03.2011, no. of assets purchased during a particular year and the depreciated value of assets according to the year of purchase of asset could not be ascertained.

Dy. Director (EA)

Receipt & Payment Accounts for Year 2010-2011

RECEIPTS					PAYMENT				
Particulars	**Plan**	**Non Plan**	**Total**	**Previous Year**	**Particulars**	**Plan**	**Non Plan**	**Total**	**Previous Year**
(A) GRANT-IN-AID					**Expenses**				
To Opening Balance					Salaries & Allowances	69774039	10000000	79774039	80351958
Cash in Bank	7,550,147	0	7,550,147	17,023,964	Medical	5501764		5501764	4176656
Cash In Hand	203,604	0	203,604	203,337	LTC	1732908		1732908	870454
			0		OTA	457902		457902	516589
To Grant in Aid (Revenue)	153,500,000	12,000,000	165,500,000	192,100,000	Honorarium	30500		30500	23400
To Grant in Aid (Capital)	1,500,000		1,500,000		Wages	7322748	2000000	9322748	7933397
To Grant (Other Projects)			0	1,415,793	Bonus	393152		393152	395324
MSC Course Fee	369,600		369,600	540,197	Fellowship	736582		736582	591821
			0		Travel Exp. (Grant in Aid)	2897631		2897631	3253457
To Bus Charges	86,009		86,009	102,578	LTC Advance			0	89612
To Rent	508,535		508,535	428,794	Travel Exp. (Res. Proj)	1018292		1018292	1883631
To WII Products	82,698		82,698	179,739	Fellowship & Wages (Research Project)	7828138		7828138	12376203
To Misc Receipts	128,811		128,811	588,094	Base Camp Expenses (Research Project)	518977		518977	829301
To Elect & Water	268,472		268,472		Leave Salary Pension Con			0	1843167
To Telephone	26,936		26,936		POL, Hiring of Veh. (Res. Proj.)	2679958		2679958	5222317
To Interest on Saving A/c	656,299		656,299	550,749	Contingencies (Res. Proj)	4341207		4341207	4017208
To Loan & Advance	671,396		671,396	380,850	M.Sc. Courses Expenses	1485263		1485263	1928965

(Recovered from staff)		0	
To Hostel Caution Money	40,200	40,200	50,500
To GPF	3,901	3,901	
Travel Advance recovered	132,373	132,373	58,754
FA Recovered	52,810	52,810	52,093
To LTC Advance	370,414	370,414	
To Medical Advance	68,164	68,164	
To T A (Research Project)	144,119	144,119	395,916
To FA (Research Project)	406,924	406,924	2,313,967
Journals & Periodicals	44,681	44,681	
To Pension Cont. TIER		0	59,258
To TDS	35,023	35,023	
To CGEGIS	91,970	91,970	2,760
To TA/FA (M.sc.)		0	505,737
Fellowship (Liability)	65,754	65,754	
EMD			131,000
To EPF			46,714

Travel Advance (M.Sc.)	33300	33300	0
Forests Advance (M.Sc.)	501476	501476	0
Telephone	679091	679091	504646
Postage	201461	201461	226412
Electricity & Water Exp	7132942	7132942	4735579
Guest House Maint.	57060	57060	0
Hospitality & Enter.	192497	192497	0
Minor Repair of Equipment/ Furniture/ EPABX	367006	367006	473867
POL for WII Vehicle	1825515	1825515	2529230
Repair & Maint of Veh	691895	691895	935952
Training Cost Expenditure	5000	5000	62775
Sty & Cmptr Consum.	609961	609961	1267564
Sports	32846	32846	236728
Legal Expenses	235755	235755	18448178
Operational Expenses	680020	680020	1611101
Printing & Binding	105020	105020	450
Maint. of WII Campus	404176	404176	700962
Estate Security	8207228	8207228	7371685
Lab Expenses (Health Lab)	1067921	1067921	0
Lab Expenses (Gen Lab)	128640	128640	778828
Lab Expenses (Res Lab)	179939	179939	621830
Lab Expenses (For Lab)	1017057	1017057	1478819
Publication	549401	549401	1603888

AMC of Computers	840115	840115	1776138
Transferred to Trg A/c for Expenditure	6000000	6000000	4300000
Govt cont to Pension Fund	5000000	5000000	5000000
Sharing of cost of Kendriya Vidyalaya	2200000	2200000	1500000
Annual Research Seminar	1200445	1200445	1025345
Workshop & Seminar		0	18068
Adv pmt to CPWD		0	11500825
Trfrd to Corpus Fund	3673288	3673288	0
By Medical Advances		0	259110
By GPF		0	152
By TDS		0	52273
EMD Release	283500	283500	0
EPF	52278	52278	0
Internal Loan	905610	905610	1311744
Project Costs	1286530	1286530	0
Refund of Project Cost	868025	868025	0
Computer & Accessories	1046435	1046435	788980
By Furniture & Fixture	57344	57344	1623957
By Journals & Periodicals	2260495	2260495	2987526
By Lab Eqpt (Res. Lab)	249931	249931	312941
By Lab Eqpt (Gen Lab)		0	68327
By Lab Eqpt (For Lab)	1899467	1899467	1225274
By Office Equipment	274127	274127	35095

					By Training Equipment			0	0
					By Library Books			0	421592
					By E Governance			0	2390238
					Civil Maintenance Work	148762		148762	0
					Vehicle Purchase	1465691		1465691	0
					By Office Eqpt (Res. Proj)	96934		96934	463860
					By Camp Eqpt (Res. Proj.)	896884		896884	2423644
					Closing Balance				
					In Bank	4568676		4568676	7550147
					In Hand	110035		110035	203604
A' Total	**167,008,840**	**12,000,000**	**179,008,840**	**217,130,794**	**A' Total**	**167008840**	**12000000**	**179008840**	**217130794**

CONSULTANCY PROJECTS

	Receipts					Payment			
Particulars	**Plan**	**Non Plan**	**Total**	**Previous Year**	**Particulars**	**Plan**	**Non Plan**	**Total**	**Previous Year**
to Opening Balance:	0	0	0						
at Bank	18,364,168.37		18,364,168.37	15,676,874.00	By Camp Equipment	32,426.00		32,426.00	655,242.00
Grant Received	20,147,518.90		20,147,518.90	17,980,237.23	By Office Equipment	556,301.00		556,301.00	287,696.00
Interest Saving A/c	412,481.00		412,481.00	382,004.00	By Camp Expenses	3,889.00		3,889.00	12,000.00
Other Receipt	4,767.00		4,767.00	2,158.00	By Contingenciges/Misc	4,261,021.00		4,261,021.00	1,878,212.00
					By Fellowship & Wages	1,886,596.00		1,886,596.00	1,525,129.00
					By Travel Expenses	3522030.16		3,522,030.16	2,026,829.00
					By POL & Maint. of veh.	385007		385,007.00	393,374.00
					By GIS of Office Data	33950		33,950.00	0.00
					By Forests Advance (FA)	40000		40,000.00	77,615.00

					Other Advance	0		0.00	50,000.00
					By Boarding & Lodging	5214880		5,214,880.00	7,158,456.01
					By TA /DA & Honorarium	247574		247,574.00	0.00
					Books	232483		232,483.00	0.00
					Duties & Taxes (Service Tax)	115967		115,967.00	30,724.00
					Transf. To Corpus Fund	0		0.00	1,038,763.00
					Publication & Printing	0		0.00	543,065.00
					Loan Director A/c No. 50650	350000		350,000.00	
					By Bank Balance	22046811.11		22,046,811.11	18,364,168.22
E' Total	**38,928,935.27**	**0.00**	**38,928,935.27**	**34,041,273.23**	**E' Total**	**38,928,935.27**	**0.00**	**38,928,935.27**	**34,041,273.23**
Grand Total	**276,070,933.79**	**12,000,000.00**	**288,070,933.79**	**322,181,791.23**	**0.00**	**276,070,933.79**	**12,000,000.00**	**288,070,933.79**	**322,181,791.23**

PENSIONS

Particulars	**Plan**	**Non Plan**	**Total**	**Previous Year**	**Particulars**	**Plan**	**Non Plan**	**Total**	**Previous Year**
To Opening Balance			0						
Cash in Bank	470,160.00		470160	2,336,137.00	By Investment in FDR (Pension Fund)	9,700,000.00		9,700,000.00	17,000,000.00
To encashment of FDR	3,271,553.00		3271553	8,540,010.00	By Commuted Value of Pension	669,212.00		669,212.00	999,888.00
To Interest (Pension A/c)	42,914.00		42914	256,010.00	By Pension/ Family Pension	2,352,607.00		2,352,607.00	2,630,854.00
To WII Contribution	9,288,386.00		9288386	9,806,856.00	By Closing Balance				
To Pension Contribution	129,434.00		129434	161,889.00	Cash in Bank	480,628.00		480,628.00	470,160.00
D' Total	**13,202,447.00**	**0.00**	**13,202,447.00**	**21,100,902.00**	**D' Total**	**13,202,447.00**	**0.00**	**13,202,447.00**	**21,100,902.00**

TRAINING ACCOUNT

Receipts					Payment				
Particulars	**Plan**	**Non Plan**	**Total**	**Previous Year**	**Particulars**	**Plan**	**Non Plan**	**Total**	**Previous Year**
To Opening in Bank	6,327,932.52		6,327,932.52	7,840,931.00	By Equipment	471922.00		471,922.00	258,219.00
Grant Received	6,000,000.00		6,000,000.00	4,300,000.00	By Office Equipment	10061.00		10,061.00	85,242.00
Interest Received	1,688,918.00		1,688,918.00	233,460.00	By Furniture & Fixture	540791.00		540,791.00	0.00
Other Receipts	175,981.00		175,981.00	2,026,133.00	By Hostel Items	272647.00		272,647.00	0.00
			0.00		By Cont/Misc	670197.00		670,197.00	513,413.00
			0		By Training Allowance	309915.00		309,915.00	722,509.00
					By Travelling Expenses	2469641.00		2,469,641.00	1,622,988.00
					TA/DA & Honorarium (Guest Faculty)	274318.00		274,318.00	228,381.00
					Stationery Items	132242.00		132,242.00	325,423.00
					POL & Maint of Vehicle	668887.00		668,887.00	409,002.00
					Boarding & Lodging	5169585.00		5,169,585.00	1,983,049.00
					Books	297141.00		297,141.00	266,891.00
					Forests Advance	292704.00		292,704.00	292,704.00
					Salary & Wages	267294.00		267,294.00	276,436.00
					Advance to Firm	65700.00		65,700.00	0.00
					Sports Item	31261.00		31,261.00	22,551.00
					Transf. to corpus Fund	2114160.00		2,114,160.00	1,065,783.00
			0					0.00	0.00
					By Closing in Bank	134365.52		134,365.52	6,327,933.00
C' Total	**14,192,831.52**	**0.00**	**14,192,831.52**	**14,400,524.00**	**C' Total**	**14,192,831.52**	**0.00**	**14,192,831.52**	**14,400,524.00**

GPF

	Receipts				Payment				
Particulars	**Plan**	**Non Plan**	**Total**	**Previous Year**	**Particulars**	**Plan**	**Non Plan**	**Total**	**Previous Year**
To Opening Bal (Bank)	3016892.00		3,016,892.00	4,700,181.00					
To GP Fund Contribution	10608790.00		10,608,790.00	9,155,886.00	By Final Payment	770,583.00		770,583.00	1,033,224.00
To Int. on saving a/c	132881.00		132,881.00	109,182.00	By Invtmt in FDR (GPF)	20,400,000.00		20,400,000.00	5,415,133.00
Encashment of FDRs	14099254.00		14,099,254.00		By Advance/withdrawl	4444166		4,444,166.00	4,500,000.00
					By Closing Balance (Bank)	2,243,068.00		2,243,068.00	3,016,892.00
F' Total	**27,857,817.00**	**0.00**	**27,857,817.00**	**13,965,249.00**	**F' Total**	**27,857,817.00**	**0.00**	**27,857,817.00**	**13,965,249.00**

CORPUS FUND

Particulars		**Non Plan**	**Total**	**Previous Year**	**Particulars**	**Plan**	**Non Plan**	**Total**	**Previous Year**
To Opening Balance	1143049.00		1143049.00	392789.00				0.00	0.00
								0.00	0.00
Misc Receipts	6717482.00		6,717,482.00	2,327,219.00	By Investment	14,300,000.00		14,300,000.00	18,000,000.00
Interests on Saving A/c	96746.00		96,746.00	22,077.00	Transferred to Grant in Aid			0.00	2,400,000.00
To Encashment of FDR	6922786.00		6,922,786.00	18,800,964.00					0.00
					Closing Balance	580,063.00		580,063.00	1,143,049.00
F' Total	**14,880,063.00**	**0.00**	**14,880,063.00**	**21,543,049.00**	**F' Total**	**14,880,063.00**	**0.00**	**14,880,063.00**	**21,543,049.00**

(P.K. Aggarwal)
Finance Officer

(P.R. Sinha)
Director

Form of Financial Statements (Non-Profit Organisations)
Balance Sheet As on 31 March 2011

(Amt. Rs.)

CORPUS / CAPITAL FUND AND LIABILITIES	Schedule	Current Year	Previous Year
CORPUS /CAPITAL FUND	1	257939956.00	260955915.00
RESERVE AND SURPLUS	2	0.00	0.00
EARMARKED FUND	3	22046811.00	18364168.00
SECURED LOAN AND BORROWINGS	4	0.00	0.00
UNSECURED LOAN AND BORROWINGS	5	314318.00	350525.00
DEFERRED CREDIT LIABILITIES	6	0.00	0.00
CURRENT LIABILITIES AND PROVISION	7	155083642.00	138794807.00
TOTAL (A)		**435384727.00**	**418465415.00**
ASSETS			
FIXED ASSETS	8	179636624.00	186817463.00
INVESTMENTS- FROM EARMARKED / ENDOWMENT FUNDS	9	0.00	0.00
INVESTMENTS- OTHERS	10	192090006.00	162573005.00
CURENT ASSETS, LOANS, ADVANCES ETC.	11	63658097.00	69074947.00
MISCELLANEOUS EXPENDITURE (to the extent not written off or adjusted)			
TOTAL (B)		**435384727.00**	**418465415.00**

(P.K. Aggarwal)
Finance Officer

(P.R. Sinha)
Director

Form of Financial Statements (Non-Profit Organisations)
Schedules Forming Part of Balance Sheet for the Year Ended 31 March, 2011

(Amt. Rs.)

SCHEDULE 1 : CORPUS / CAPITAL FUND		Current Year	Previous Year
Balance as at the beginning of the year		220891745.00	232860913.00
Add: Contribution towards Corpus/ Capital fund		19598592.00	22832382.00
Less : Pre receipted Bill of consultancy Project		(-) 3804705.00	0.00
Add/(Deduct) : Balance of net income (expenditure) transferred from		(-) 26674056.00	(-) 34801550.00
TOTAL	**A**	**210011576.00**	**220891745.00**
CORPUS FUND			
Opening Balance		40064170.00	36605274.00
Received during the year		6717482.00	2349296.00
Add Accrued Interest		964571.00	1683062.00
Add Interest Earned		182157.00	1826538.00
Less : Payment made to Grant in Aid		0.00	(-) 2400000.00
Total	**B**	**47928380.00**	**40064170.00**
Total A+B		**257939956.00**	**260955915.00**

Form of Financial Statements (Non-Profit Organisations)
Schedules Forming Part of Balance Sheet for the Year Ended 2010-11

SCHEDULE 3 : EARMARKED FUNDS	Current Year	Previous Year
a) Opeining Balance of the Funds	18364168.37	15676874.00
b) Addition to the Funds		
i Grants Received	20147518.90	17980237.00
ii Interest Received	412481.00	382004.00
iii Other Receipts	4767.00	2158.00
iv Pre receipted Bill issued	4535675.00	0.00
Total	**25100441.90**	**18364399.00**
TOTAL (A+B)	**43464610.27**	**34041273.00**
Utilisation/Expendition towards objectives of funds		
c) i Capital Expenditures		
Fixed Assets		
Camp Equipment	32426.00	655242.00
Office Equipment	556301.00	287696.00
ii Revenue Expenditure		
Camp Expenses	3889.00	12000.00
Contigencies/Misc.	4261021.00	2421277.00
Fellowship & Wages	1886596.00	1525129.00
Travel Expenses	3769604.16	2026829.00
POL & Maint. Of Vehicle	385007.00	393374.00
GIS & Office Data	33950.00	0.00
Advance for Expenses (FA)	40000.00	77615.00
Boarding & Lodging	5214880.00	7158456.00
Transferred to Corpus Fund	0.00	1038763.00
Duties & Taxes (Service Tax)	115967.00	30724.00
Books	232483.00	0.00
Advance paid to firm	0.00	50000.00
Loan D/WII A/c No. 50650	350000.00	
iii Pre receipted Bill yet to be received	4535675.00	0
TOTAL-C	**21417799.16**	**15677105.00**
NET BALANCE AS AT THE YEAR-END (A+B-C)	**22046811.11**	**18364168.00**

SCHEDULE 5 : UNSECURED LOANS AND BORROWINGS	Current Year	Previous Year
(1) Central Govt.	0.00	
(2) State Govt.(Specify)	0.00	
(3) Financial Institutions	0.00	
(4) Banks		
(i) Term Loans	0.00	
(ii) Others (specify)	0.00	
(5) Other Institutions and Agencies	0.00	
(6) Debentures and Bonds	0.00	
(7) Fixed Deposits	0.00	
(8) Others (Specify)		
Security Deposit	314318.00	350525.00
Loans		0.00
TOTAL	**314318.00**	**350525.00**

SCHEDULE 7 : CURRENT LIABILITIES AND PROVISION	Current Year	Previous Year
(A) CURRENT LIABILITIES		
(1) Acceptances		
(2) Sundry Creditors		
(1) For Goods		
(2) For Others		
Other Payments outstanding(Grant-in-aid) (07-08)	33976.00	265449.00
Other Payments outstanding(Grant-in-aid) (09-10) (669528+575645)	295666.00	1245173.00
Other Payments outstanding (Grant in Aid) (10-11)	323860.00	
(3) Advances Received		
Hostel Caution Money	158960.00	118760.00
(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	108174429.00	97500245.00
GP Fund	45344983.00	38714624.00
(6) Others (Specify)		
EMD Received	539353.00	822853.00
TOTAL (A)	**154871227.00**	**138667104.00**
(B) Provisions		
(1) For Taxation		
TDS (12280+35023)	47303.00	12280.00
(2) Gratuity		
(3) Superannuation/ Pension		

(4) Accumulated Leave Encashment		
(5) Trade Warranties/ Claims		
(6) Others (Specify)		
Pension Fund (Tier II)	0.00	59258.00
GPF	4673.00	772.00
Bank Loans	0.00	400.00
CGEGIS	94685.00	2715.00
Sale Tax/Trade Tax/Prof.Tax/ Com. Tax	0.00	0.00
EPF Subscription	0.00	52278.00
Fellowship (Arrear)	65754.00	0.00
TOTAL (B)	**212415.00**	**127703.00**
TOTAL (A+ B)	**155083642.00**	**138794807.00**

Form of Financial Statements (Non-Profit Organisations)
Schedules Forming Part of Balance Sheet for the Year Ended 2010-11
Schedule 8 : Fixed Assets

Pariculars	Gross Block				DEPRECIATION				NET BLOCK	
	Cost as at the beginning of the year	Addition during the year Upto 30-Sep	After 30-Sep	Deduction during the year	Cost as at the the end of the year	As at the beginning of the year	For the the year	Deduction during year	At the end of the year the year	As at the current year end	As at the Previous year end
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	**124,782,03.58**	**0.00**	**0.00**	**0.00**	**124,782,03.58**	**0.00**	**0.00**	**0.00**	**0.00**	**124,782,03.58**	**124,782,03.58**
BUILDINGS											
BLOCK: 10%											
Arch. & Sprvson Fee	3858267.54	0.00	0.00	0.00	3858267.54	428696.39	385826.75	0.00	385826.75	3472440.79	3858267.54
Auditorium	5777639.69	0.00	0.00	0.00	5777639.69	641959.97	577763.97	0.00	577763.97	5199875.72	5777639.69
Boundary Fencing	352094.41	0.00	0.00	0.00	352094.41	39121.60	35209.44	0.00	35209.44	316884.97	352094.41
Boundary Wall	622541.96	0.00	0.00	0.00	622541.96	69171.33	62254.20	0.00	62254.20	560287.76	622541.96
Building Complex	82833209.51	1325165.00	0.00	0.00	84158374.51	9203689.95	8415837.45	0.00	8415837.45	75742537.06	82833209.51
Corr. during the year of Bldg Complex	(-) 845518.37				(-) 845518.37		(-) 84551.84		(-) 84551.84	(-)760966.53	(-)845518.37
Campus Development	16910506.76	9030567.00	0.00	0.00	25941073.76	1878945.20	2594107.38	0.00	2594107.38	23346966.38	16910506.76

Materials and Supplies	1668660.68	0.00	0.00	0.00	1668660.68	185406.74	166866.07	0.00	166866.07	1501794.61	1668660.68
Tennis Court	228514.48	0.00	0.00	0.00	228514.48	25390.50	22851.45	0.00	22851.45	205663.03	228514.48
Sports Complex	144797.48	0.00	0.00	0.00	144797.48	16088.61	14479.75	0.00	14479.75	130317.73	144797.48
BLOCK: 20%					0.00		0.00			0.00	
Road & Culvert	383681.35	0.00	0.00	0.00	383681.35	95920.34	76736.27	0.00	76736.27	306945.08	383681.35
Staff Quarters	4780718.34	0.00	0.00	0.00	4780718.34	1195179.59	956143.67	0.00	956143.67	3824574.67	4780718.34
Corr. during the year for Staff Qtrs	475590.59	0.00	0.00	0.00	475590.59	0.00	95118.12		95118.12	380472.47	475590.59
TOTAL	**117,190,704.42**	**103,557,32.00**	**0.00**	**0.00**	**127,546,436.42**	**137,795,70.22**	**133,186,42.67**	**0.00**	**133,186,42.67**	**114,227,793.75**	**117,190,704.42**
PLANT MACHINERY & EQPT											
BLOCK: 20%											
Vehicle	952476.48	0.00	1465691.00	0.00	2418167.48	238119.12	337064.40		337064.40	2081103.08	952476.48
Development of Foerensic Laboratory	5553201.68	168904.00	17305	0.00 63.00	7452668.68	1372777.79	13174 77.44		1317477.44	6135191.24	5553201.68
Training Equipment	975293.76	0.00	0.00	0.00	975293.76	243823.44	195058.75		195058.75	780235.01	975293.76
BLOCK: 25%											
AC Plant	875170.84	0.00	0.00	0.00	875170.84	291723.61	218792.71		218792.71	656378.13	875170.84
Camp Equipment (project)	237924.71	0.00	0.00	0.00	237924.71	79308.24	59481.18	0.00	59481.18	178443.53	237924.71
DG Set	1731898.34	0.00	0.00	0.00	1731898.34	577299.45	432974.59	0.00	432974.59	1298923.76	1731898.34
EPABX	167974.64	0.00	0.00	0.00	167974.64	55991.55	41993.66	0.00	41993.66	125980.98	167974.64
Lab Equipment	4627607.32	249931.00	0.00	0.00	4877538.32	1542535.77	1219384.58	0.00	1219384.58	3658153.74	4627607.32
Office Equipment	2489505.62	214082.00	60045.00	0.00	2763632.62	829835.21	683402.53	0.00	683402.53	2080230.09	2489505.62

Training Equipment (Training A/c)	4212462.90	20205.00	451717.00	0.00	4684384.90	1364237.97	1114631.60	0.00	1114631.60	3569753.30	4212462.90
Office Equipment (Project)	11618.44	0.00	0.00	0.00	11618.44	3872.81	2904.61	0.00	2904.61	8713.83	11618.44
Office Equipment (Research Project)	2916209.81	89410.00	7524.00	0.00	3013143.81	964943.10	752345.45	0.00	752345.45	2260798.36	2916209.81
Camp Equipment (Research Project)	6626535.41	299937.00	596947.00	0.00	7523419.41	2162631.00	1806236.48	0.00	1806236.48	5717182.93	6626535.41
TOTAL	**313,778,79.95**	**104,246,9.00**	**431,248,7.00**	**0.00**	**367,328,35.95**	**972,709,9.06**	**818,174,7.97**	**0.00**	**818,174,7.97**	**285,510,87.98**	**313,778,79.95**

FURNITURE, FIXTURES

BLOCK : 15%

Furinitures & Fixtures	7532686.20	41160.00	16184.00	0.00	7590030.20	1300231.80	1137290.73	0.00	1137290.73	6452739.47	7532686.20
Furniture & Fixture (Training)	6015.57	448497.00	92294.00	0.00	546806.57	1061.57	75098.94	0.00	75098.94	471707.63	6015.57
TOTAL	**753,870,1.77**	**489657.00**	**108478.00**	**0.00**	**8136836.77**	**1301293.37**	**1212389.67**	**0.00**	**1212389.67**	**6924447.10**	**7538701.77**

OFFICE EQUIPMENT

BLOCK : 20%

Office Equipment (Training A/c)	202522.72		10061.00	0.00	212583.72	40561.68	41510.64	0.00	41510.64	171073.08	202522.72
TOTAL	**202522.72**	**0.00**	**10061.00**	**0.00**	**212583.72**	**40561.68**	**41510.64**	**0.00**	**41510.64**	**171073.08**	**202522.72**

COMPUTER / PERIPHERALS

BLOCK : 20%

Computer and Periphrals	981044.66			0.00	981044.66	245261.17	196208.93	0.00	196208.93	784835.73	981044.66

BLOCK : 60%											
Computer & Accessories	1156129.34	679902.00	366533.00	0.00	2202564.34	1643854.25	1211578.70	0.00	1211578.70	990985.64	1156129.34
E Governance	956095.20	0.00	0.00		956095.20	1434142.80	573657.12	0.00	573657.12	382438.08	956095.20
TOTAL	**3093269.20**	**679902.00**	**366533.00**	**0.00**	**4139704.20**	**3323258.22**	**1981444.76**	**0.00**	**1981444.76**	**2158259.44**	**3093269.20**
BOOKS											
BLOCK : 10%											
Journals & Periodicals	12425616.62	2109573.00	123700.00	0.00	14658889.62	1266101.29	1459703.96	0.00	1459703.96	13199185.66	12425616.62
Library Books	2140636.70	0.00		0.00	2140636.70	236293.02	214063.67	0.00	214063.67	1926573.03	2140636.70
TOTAL	**14566253.32**	**2109573.00**	**123700.00**	**0.00**	**16799526.32**	**1502394.31**	**1673767.63**	**0.00**	**1673767.63**	**15125758.69**	**14566253.32**
GRAND TOTAL	**186,447,534.96**	**146,773,33.00**	**492,125,9.00**	**0.00**	**206,046,126.96**	**296,741,76.86**	**264,095,03.33**	**0.00**	**264,095,03.33**	**179,636,623.63**	**186,447,534.96**

Form of Financial Statements (Non-Profit Organisations)
Schedules Forming Part of Balance Sheet for the Year Ended 31 March, 2011

(Amt. Rs.)

SCHEDULE : 10 INVESTMENT - OTHERS	Current Year	Previous Year
(1) In the Govt. Securities		
(2) Other approved Securities		
(3) Shares		
(4) Debentures and Bonds		
Investment in RBI Bond (GPF)	27416000.00	9416000.00
Investment in RBI Bond (Pension)	35808000.00	27308000.00
Investment in RBI Bond (Corpus Fund)	29800000.00	18000000.00
(5) Subsidaries and Joint Ventures		
(6) Others (Specify)		
Investment in FDR (GPF)	14824032.00	24171822.00
Investment in FDR (Pension Fund)	67658228.00	64439124.00
FDR Corpus Fund	16583746.00	19238059.00
TOTAL	**192090006.00**	**162573005.00**

(Amt. Rs.)

SCHEDULE :11 CURRENT ASSETS, LOANS, ADVANCES ETC.	Current Year	Previous Year
(A) CURRENT ASSETS		
(1) Inventories		
Closing Stock of Steel & Cement	0.00	131275.00
Advance paid for Journals (Grant in Aid)	91519.00	53783.00
Closing Balance of WII Publication	888874.00	963866.00
(2) Sundry Debtors		
(1) Debts Outstanding for a period exceeding six months	108978.00	206937.00
(2) Others (Specify)		
(3) Cash balances in hand (including cheques/drafts and imprest)		
Grant-in-Aid A/c	110035.00	203604.00
Training A/c	0.00	0.00
Pension Fund A/c	0.00	0.00
GPF A/c	0.00	0.00
Corpus Fund	0.00	
(4) Bank Balances		
(1) With Scheduled Banks		
Grant-in-Aid A/c	4568676.00	7550147.00
Training A/c	134365.00	6327933.00
Pension Fund A/c	480628.00	470160.00
GPF A/c	2243068.00	3016892.00
Corpus fund No 4032	580063.00	1143049.00
Endowment Funds	22046811.00	18364168.00
TOTAL (A)	**31253017.00**	**38431814.00**

(B) LOANS, ADVANCES AND OTHER ASSETS	Current Year	Previous Year
(1) Loans		
(1) Staff		

Loan & Advances to Staff	798225.00	1130600.00
Advance for expenses (Staff) (33300+502026+ 98758+654204+20324+190946)	1499558.00	1588543.00
Advance for Expenses to Staff (Training A/c)	292704.00	292704.00
Advance for expenses (Research Projects) (145072+50140)	195212.00	746255.00
Land Acquisition Charges (Deposited in Hon'ble High Court)	18000000.00	0.00
(2) Other entities engaged in activities /objectives similar to		
(3) Others (Specify)		
Adv for civil work to CPWD	2450500.00	11976310.00
Loan to Other A/c To A/c No. 4032	0.00	15774.00
Internal Loan (673610+564313+232000)	1469923.00	564313.00
(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
Security Deposit for Electricity Connection	412283.00	0.00
Advance payment to firm (Training)	65700.00	
(3) Income Accrued		
(1) On Investments from Earmarked / Endowment Funds		
(2) On Invesments -Others		
Interest Accrued in FDR (GPF)	861883.00	2109910.00
Interest Accrued in FDR (Pension Fund)	4227573.00	5282961.00
Interest Accrued in FDR (Corpus Fund)	964571.00	1683062.00
(3) On Loans and Advances		
(4) Others (Specify)		
Training Cost Accrued But not Received	838375.00	838375.00
Pre-receipted bill issued but not received	0.00	3804705.00
(4) Expenses payable towards capital/fixed Assets		
(1) Grant in Aid A/c 2007-08 (339757-305781)	33976.00	33976.00
(2) Grant in Aid (2009-10) (575645-281048)	294597.00	575645.00
TOTAL (B)	**32405080.00**	**30643133.00**
TOTAL (A+B)	**63658097.00**	**69074947.00**

(P.K. Aggarwal)
Finance Officer

(P.R. Sinha)
Director

Form of Financial Statements (Non-Profit Organisations)
Income and Expenditure Account for the Year Ended 2010-11

(Amt. Rs.)

	Schedule	Current Year	Previous Year
INCOME			
Income from Sales/Services	12	0.00	0.00
Grants/Subsidies	13	147401408.00	169267618.00
Fees/Subscriptions	14	8058518.00	10671035.00
Income from Investments (from earmarked/endowment Funds Transferred to funds)	15	0.00	0.00
Income from Royalty, Publication etc	16	1096461.00	1299205.00
Interest Earned	17	1259089.00	1025143.00
Other Income	18	219170.00	1415793.00
Increase/decrease) in stock of Finished goods and works-in-progress	19	0.00	0.00
TOTAL (A)		**158034646.00**	**183678794.00**
EXPENDITRUE			
Establishment Expenses (Plan & Non Plan)	20	111836019.00	110921096.00
Other Administrative Expenses (Plan & Non Plan)	21	46463180.00	77885071.00
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)		26409503.33	29674177.00
TOTAL (B)		**184708702.33**	**218480344.00**
Balance being excess of Income over Expenditure (A-B)		-26674056.33	-34801550.00
BALANCE BEING SURPLUS (DEFICIT) CARRIED TO CORPUS/CAPITAL FUND		**-26674056.33**	**-34801550.00**

Form of Financial Statements (Non-Profit Organisations)
Income and Expenditure Account for the Year Ended 2010-11

(Amt. Rs.)

SCHEDULE :13 GRANTS / SUBSIDIES	Current Year	Previous Year
(1) Central Government		
Grant -in- Aid from MoEF	167000000.00	192100000.00
Amt capitalized (-)	19598592.00	-22832382.00
TOTAL	**147401408.00**	**169267618.00**
(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	**147401408.00**	**169267618.00**

Form of Financial Statements (Non-Profit Organisations)
Income and Expenditure Account for the Year Ended 2010-11

(Amt. Rs.)

SCHEDULE : 14 FEES / SUBSCRIPTIONS	Current Year	Previous Year
(1) Entrance Fees		
M.Sc.Course Fee	369600.00	540197.00
(2) Annual Fees/ Subscriptions		0.00
(3) Seminar/ Program Fees		
Seminar/ Workshop Fees		0.00
(4) Consultancy Fees		
Consultancy refund		0.00
(5) Others (Specify)		
Other Receipt (Training)	1688918.00	2026133.00
Receipt for Training courses	6000000.00	4300000.00
Pre-receipted bill issued but not received	0.00	3804705.00
Misc. Receipts (Training A/c)	0.00	0.00
Receipt for Training Cost		
TOTAL	**8058518.00**	**10671035.00**

Form of Financial Statements (Non-Profit Organisations)
Income and Expenditure Account for the Year Ended 2010-11

(Amt. Rs.)

SCHEDULE :16 INCOME FROM ROYALTY, PUBLICATION ETC.	Current Year	Previous Year
(1) Income from Royalty		
(2) Income from Publications		
(3) Others (Specify)		
Misc. Receipts	123811.00	588094.00
WII Products	82698.00	179739.00
House Licence Fee	508535.00	428794.00
Bus Charges	86009.00	102578.00
Electricity & Water Charges	268472.00	
Telephone	26936.00	
TOTAL	**1096461.00**	**1299205.00**

Form of Financial Statements (Non-Profit Organisations)
Income and Expenditure Account for the Year Ended 2010-11

(Amt. Rs.)

SCHEDULE : 17 INTEREST EARNED	Current Year	Previous Year
(1) On Term Deposits		
(1) With Scheduled Banks		
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)		
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	656299.00	550749.00
Interest on Saving A/c (Training A/c)	175981.00	233460.00
(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	426809.00	240934.00
(2) Others		0.00
(4) Interest on Debtors and Other Receivables		
TOTAL	**1259089.00**	**1025143.00**

Form of Financial Statements (Non-Profit Organisations)
Income and Expenditure Account for the Year Ended 2010-11

(Amt. Rs.)

SCHEDULE :18 OTHER INCOME	Current Year	Previous Year
(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	5000.00	0.00
Receipt for Project	214170.00	1415793.00
TOTAL	**219170.00**	**1415793.00**

(Amt. Rs.)

SCHEDULE : 19 INCREASE / DECREASE IN STOCK OF FINISHED GOODS	Current Year	Previous Year
(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**

Form of Financial Statements (Non-Profit Organisations)
Income and Expenditure Account for the Year Ended 2010-11

(Amt. Rs.)

SCHEDULE : 20 ESTABLISHMENT EXPENSES	Current Year		Previous Year	
	Plan	Non Plan	Plan	Non Plan
(1) Salaries and Wages				
Fellowship	736582.00		591821.00	
Honorarium	30500.00		23400.00	
Medical	5501764.00		4176656.00	
Salaries & Allowances	64343764.00	10000000.00	66543635.00	12000000.00
Stipend	348049.00		231970.00	
Wages	7322748.00	2000000.00	7933397.00	
Fellowship & Wages (7828138-65754) (Research Project)	7762384.00		12376203.00	
(2) Allowances and Bonus				
Bonus	393152.00		395324.00	
OTA	457902.00		516589.00	
LTC	1732908.00		870454.00	
Corps Fund (Training)	2114160.00		1065783.00	
Transferred to Corpus Fund	3673288.00			
Honorarium (Training A/c)	274318.00		261285.00	
(3) Others (Specify)				
(4) Contribution to Other Fund (Specify)				
Leave Salary and Pension Contr.	4288836.00		1843167.00	
(5) Staff Welfare Expenses				
Uniforms	0.00		0.00	
(6) Expenses on Employees Retirement and Terminal Benefits				
Final Payment			913395.00	
Leave Encashment & Gratuity	336687.00		348716.00	
			0.00	
(7) Others (Specify)				
Camp Expenses (Research Project)	518977.00		829301.00	
TOTAL	**99836019.00**	**12000000.00**	**98921096.00**	**12000000.00**

Form of Financial Statements (Non-Profit Organisations)
Income and Expenditure Account for the Year Ended 2010-11

(Amt. Rs.)

SCHEDULE : 21 OTHER ADMINISTRATIVE EXPENSES	Current Year		Previous Year	
	Plan	Non Plan	Plan	Non Plan
AMC of Computers	840115.00	0.00	1776138.00	
Annual Research Seminar	1200445.00	0.00	1025345.00	
Contingencies/Misc. (Research Project)	4341207.00	0.00	4017208.00	
Cont./Misc.(Training Account)	6840367.00	0.00	3678763.00	
Electricity and Water Charges (7132942-412283)	6720659.00	0.00	4735579.00	
Estate Maintenance	552938.00	0.00	700962.00	
Estate Security	8207228.00	0.00	7371685.00	
Govt. Contribution to Pension Fund	5000000.00	0.00	5000000.00	
Lab Expenses (Research lab)	179939.00	0.00	1400658.00	
Lab Expenses (Forensic Lab) (1017057-383451)	633606.00	0.00	1478819.00	
Lab Expenses (Genetic Lab)	128640.00	0.00	0.00	
Lab Expenses (Health Lab) (1067921-254937)	812984.00	0.00	0.00	
Legal Expenses	235755.00	0.00	18448178.00	
M.Sc. Course Expenditure (1485263-348049)	1137214.00	0.00	1696995.00	
Operational Expenses (929577-1096)	928481.00	0.00	1611101.00	
Pension Contribution	804752.00	0.00	546212.00	
POL & Maintenance of Vehicle (Research Project)	2679958.00	0.00	5222317.00	
POL & Maintenance of Vehicle (Training A/c)	668887.00	0.00	409002.00	
POL for Vehicles/DG Set	1825515.00	0.00	2529230.00	
Postage & Telegrams	201461.00	0.00	226412.00	
Printing & Binding	105020.00	0.00	450.00	
Printing of Books for Project	23700.00	0.00	0.00	
Publication	549401.00	0.00	1603888.00	

Repair & Maintenance of Vehicles	691895.00	0.00	935952.00	
Repair & Maintenance furniture & fixture	367006.00	0.00	473867.00	
Sharing of cost of Kendriya Vidyalaya	2200000.00	0.00	1500000.00	
Sports Goods	32846.00	0.00	236728.00	
Stationery (609961-28975)	580986.00	0.00	1267564.00	
Training Allowance	309915.00	0.00	722509.00	
Telephone & TC	679091.00	0.00	504646.00	
Training & Skill Upgradation of Staff	5000.00	0.00	62775.00	
Training Cost Expenditure	6000000.00	0.00	4300000.00	
Travel Exp. (Grant in Aid)	2897631.00	0.00	3253457.00	
Travel Exp. (Research Project)	1018292.00	0.00	1883631.00	
Travelling Expenses (Training A/c)	2469641.00	0.00	1900988.00	
Workshop/Seminar	0.00	0.00	18068.00	
Refunded to MoEF towards unspent balance of Project Cost (08-09)	868025.00			
Refunded to Other Project towards project cost	1477000.00			
Less : Cancellation of Supply Order (9094+13042+40654)	0.00	0.00	-62790.00	
Less : Cancellation of Supply Order (2007-08) (265449-33976)	-231473.00			
Less : Pmnt made drng 09-10 for 08-09 (3034878-62790)		0.00	-2972088.00	
Less : Payment made of 08-09 of Research Project	0	0.00	-288706.00	
Payment Outstanding for Grant in Aid, Research Projects (2009-10)			669528.00	
Add : Expenditure wrongly less in 09-10	155193.00			
Less : Payment shown in Legal expenses in 09-10 (instead of Sch- 11)	-18000000.00			
Payment Outstanding of Research Project (2010-11)	323860.00			
TOTAL	**46463180.00**	**0.00**	**77885071.00**	**0.00**

(P.K. Aggarwal)
Finance Officer

(P.R. Sinha)
Director

Annexure - I

Form of Financial Statements (Non-Profit Organisations)
Fixed Assets Purchased from Funds Reflected in Schedule-3

(Amt. Rs.)

Particulars	Gross 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	cost as at the previous year -end
EQUIPMENT					
Camp Equipment (conslt project)	10066084.29	32426.00	0.00	10098510.29	10066084.28
Total	**10066084.29**	**32426.00**	**0.0**	**10098510.29**	**10066084.28**
OFFICE EQUIPMENT					
Office Equipment (Conslt Project)	845409.38	556301.00	0.00	1401710.38	845409.38
Total	**845409.38**	**556301.00**	**0.0**	**1401710.38**	**845409.38**
Grand Total	**10911493.67**	**588727.00**	**0.00**	**11500220.67**	**10911493.67**

(P.K. Aggarwal)
Finance Officer

(P.R. Sinha)
Director

Form of Financial Statements (Non-Profit Organisations)
Name of Equity : Schedules Forming Part of the Accounts
for the period Ended on 31st March 2011

SCHEDULE - 25 SIGNIFICANT ACCOUNTING POLICES (Notes on Accounts)

1. Accounts of the institute have been prepared on accrual basis and accrued interest has been accounted for the Accounts.
2. Depreciation has been allowed on Assets at the rate prescribed by the Income Tax Department, Govt. of India and being charged on pro-rata basis. For equipments which are being used in field, higher rate of depreciation is being charged than those at office.
3. The funds received for expenditure on consultancy projects (Externally Funded) have now been shown under Liabilities as per direction of Audit (C&AG). The balance available and expenditure incurred on these projects is reflected in Schedule-3 of Balance Sheet. The Fixed Assets created from these funds are mentioned Annexure-I.
4. The Institute has created a Corpus Fund as per decision of XLVII Governing Body meeting. The receipts on account of unspent balance of externally funded projects which are not required to be refunded back, interest credited by Bank, saving from the Consultancy project and other petty misc. receipts etc are being deposited in Corpus Fund. Separate Receipt & Payment Account for transactions relating to Corpus Fund has been maintained as per direction of Audit (C&AG)
5. Being a Research Institute of Govt. of India, it is exempted from Custom Duty on imported scientific items.
6. Institute has been directed by Finance Committee to keep its investments only in FDR with Nationalised Banks/RBI Bonds.

(P.K. Aggarwal)
Finance Officer

(P.R. Sinha)
Director

General Provident Fund Account No. 518502010001297
Income and Expenditure Account
For the year Ended 2010-11

Income		Expenditure	(Amt. Rs.)
Particulars	**Amount**	**Particulars**	**Amount**
Opening Balance	3016892	Final payment of GPF	770583
Interest Received on Saving Account	132881	Investment	20400000
Interest Earned on FDR	241554	Advance/Withdrawal paid	4444166
GPF Contribution	10608790	Interest Accrued and invested	861883
Encashment of FDR	13857700		
Interest Accrued on FDR	861883.00	Bank Balance	2243068
TOTAL	**28719700**	**TOTAL**	**28719700**

Pension Fund Account No. 518502010000018
Income and Expenditure Account
For the year ended 2010-11

Income		Expenditure	(Amt. Rs.)
Particulars	**Amount**	**Particulars**	**Amount**
Opening Balance	470160	Investment in FDR	9700000
Interest Received on Saving Account	42914	Commuted Value of Pension	669212
Interest Earned on FDR	7696	Family Pension/ Pension	2352607
WII Contribution	9288386	Interest Accrued and invested	4227573
Encashment of FDR	3263857		
Pension Contribution	129434	Bank Balance	480628
Interest Accrued	4227573		
TOTAL	**17430020**	**TOTAL**	**17430020**

WII-UNESCO PROJECT
Receipt & Payment for the period of 01-04-2010 to 31-03-2011

Receipt	Amount	Payment	Amount
Opening Balance	3,590,898.25	Loan:-Envis (Software ERDAS Apollo Suite)	91,058.00
Intt.Received	125,098.00		
		Expenditure Total	91,058.00
		Bank Balance A/c No. 44	3,624,938.25
G. Total	**3,715,996.25**	**G. Total**	**3,715,996.25**

WII-DGH Seaturtle Telemetry Project
Receipt & Payment
For the period of 01-04-2010 to 31-03-2011

Receipt	Amount	Payment	Amount
Opening Balance	7,364,795.76	Fellowship and Wages	795,474.00
Grant:		POL & Maint. Of Vehicle	1,181,401.00
IUCN International Union of Conservation of Nature	269,630.00	Base Camp Expenditure	50,038.00
MoTS, New Delhi	76,800.00	Travelling Expenses	452,530.00
TDS Refund	542,110.00	Office Equipment	707,672.00
		Camp Equipment	600.00
		Contingency	376,225.50
Intt. Received	225,406.00	Advance for Expenses	915,129.00
		Workshop & Saminar	155,409.00
		Expenditure Total	4,634,478.50
		Bank Balance A/c No. 59	3,844,263.26
G. Total	**8,478,741.76**	**G. Total**	**8,478,741.76**

AVIAN Malaria Project
Receipt & Payment
For the period of 01-04-2010 to 31-03-2011

Receipt	Amount	Payment	Amount
Opening Balance	24,780.00	Travel Expenditure	17,195.00
Intt. Received	10,091.00		
Loan- Director WII A/c No. 08	350,000.00		
		Expenditure Total	17,195.00
		Bank Balance A/c No. 50650	367,676.00
G. Total	**384,871.00**	**G. Total**	**384,871.00**

Tiger Response to Prey Human Disturbance
Receipt & Payment
For the period of 01-04-2010 to 31-03-2011

Receipt	Amount	Payment	Amount
Opening Balance	260,696.00	Fellowship & Wages	351802.00
Grant Received	3,376,519.30	Base Camp Expenditure	28683.00
Intt. Received	24,464.00	Travel Expenditure	785261.00
		POL & Vehicle of Maint.	6076.00
		Contigencies	113251.00
		Office Equipment	80189.00
		Establishment of Building	78786.00
		Accommodation	253578.00
		Meals & Refreshment	92189.00
		Workshop Materials	28396.00
		Advance for Expenses	615355.00
		Expenditure Total	2,433,566.00
		Bank Balance A/c No. 60	1,228,113.30
G. Total	**3,661,679.30**	**G. Total**	**3,661,679.30**

WII Ecological Field Studies in Sariska Tiger Reserve (Rajasthan)
Receipt & Payments
For the period of 01.04.2010 to 31.03.2011

Receipt	Amount	Payment	Amount
Opening Balance	25790.00	Contingencies	0.00
Interest received 2010-11	1004.00	Equipment	0.00
		Travel	0.00
		Corpus Fund	26794.00
		Bank Balance A/C No - 61	0.00
G. Total	**26794.00**	**G.Total**	**26794.00**

WII Management Effectiveness Evaluation (MEE) Project
Receipt & Payments
For the period of 01.04.2010 to 31.03.2011

Receipt	Amount	Payment	Amount
Opening Balance	1280126.00	Wages	135850.00
Interest received 2010-11	52766.00	Contingencies	2500.00
Grant MEE Tiger Reserve	1540000.00	Travel	752963.00
		MEE Tiger Reserve	1302971.00
		Bank Balance A/C No - 62	678608.00
G. Total	**2872892.00**	**G. total**	**2872892.00**

WII Barcoding Anurans of India
Receipt & Payments
For the period of 01.04.2010 to 31.03.2011

Receipt	Amount	Payment	Amount
Opening Balance	132692.00	Fellowships	42000.00
Interest received 2010-11	3763.00	Consumeable	13592.00
Grant Received	0.00	Travel	4675.00
		Contingencies	11732.00
		Bank Balance A/C No - 65	64456.00
G.Total	**136455.00**	**G. Total**	**136455.00**

WII A Study on the Population Dynamics and Site Fidelity of the Olive Ridley Sea Turtles at the Rushikulya Roorkery in Orissa Coast of India
Receipt & Payments, For the period of 01.04.2010 to 22.09.2010

Receipt	Amount	Payment	Amount
Opening Balance	83190.00	Fellowships	200667.00
Interest received 2010-11	3311.00	Consumeable	1316.00
Grant Received	300000.00	Travel	1387.00
		Contingencies	1694.00
		Bank Balance A/C No - 50187	181437.00
G. Total	**386501.00**	**G. Total**	**386501.00**

WII Survey & Mapping of Medicinal Plants in Uttrakhand
Receipt & Payments
For the period of 01.04.2010 to 31.03.2011

Receipt	Amount	Payment	Amount
Opening Balance	788391.00	Fellowships	446483.00
Interest received 2010-11	33868.00	Consumeable	70899.00
Grants Medicinal Plants	1230000.00	Travel	164965.00
Grants Assessment of Banj Oak Forests	100000.00	Contingencies	39820.00
Grants Assessment of sand mining in UK	800000.00	Equipment	21525.00
		Expenditure Assessment of Banj Oak Forests in Uttarakhand	221373.00
		Expenditure Assessment of Sand Mining in Uttarakhand	165078.00
		Bank Balance A/C No - 50188	1822116.00
G. Total	**2952259.00**	**G. Total**	**2952259.00**

Current Status and Availability of High Value Medicinal Plants in Alpine Zones of Dhauladhar Wildlife Sanctuary Western Himalaya
Receipt & Payments, For the period of 01.04.2010 to 31.03.2011

Receipt	Amount	Payment	Amount
Opening Balance	197615.00	Fellowships	200000.00
Interest received 2010-11	11276.00	Consumeable	29301.00
Grant Received	350000.00	Travel	24800.00
		Contingencies	3795.00
		Bank Balance A/C No - 50281	300995.00
G. Total	**558891.00**	**G. Total**	**558891.00**

Receipt & Payment
Monitoring Reintroduced Gaurs in the Bandhavgarh Tiger Reserve (MP)
For the period 01.04.2010 to 31.03.2011

Receipt	Amount	Payment	Amount
Opening Balance	966439.00	FA	0.00
Interest Received 2010-11	34021.00	TA	0.00
		Purchase of 2 satellite radio collars, 13 VHF collars 4 receivers,4 antennas from M/S Telonics USA	0.00
		Purchase of immoblilization equipment, accessories and drugs	0.00
		Hiring of 2 Research Fellow & 4 Field Asstt for 3 years	66716.00
		TA/DA for the researchers/Resource Persons/Investigators	63199.00
		Hiring of 1 four-wheel drive vehicle with driver and POL charges	95157.00
		Purchase of other field equipment (GPS Compass Range Finder,Binocluars, Camera etc)	0.00
		Contingency/Misc	29153.00
		Bank Balance A/C No 50529	746235.00
G. Total	**1000460.00**	**G. Total**	**1000460.00**

Receipt & Payment
Monitoring of Source Population of Tigers in Ranthambore Tiger Reserve
For the period 01.04.2010 to 31.03.2011

RECEIPT	Amount	Payment	Amount
Opening Balance	2785622.00	Loan	0.00
Interest received 2010-2011	188444.00	FA	0.00
Loan refund from A/C No 50968	3000000.00	TA	5000.00
Refund of Advances	117000.00	Equipment	0.00
		Contingencies	128498.00
		Fellowship & Wages	28400.00
		Travel	21621.00
		Vehicle Hiring	119144.00
		Procurement of Radio Collars & Accessories	156461.00
		Bank Balance A/C N0 64	5631942.00
G. Total	**6091066.00**	**G. Total**	**6091066.00**

Receipt & Payment
Monitoring of Re-introduced Tigers in Sariska Tiger Reserve
For the period wef 01.04.2010 to 31.03.2011

Receipt	Amount	Payment	Amount
Opening Balance	677564.00	FA	0.00
Interest Received 2010-2011	8507.00	Fellowship	147643.00
Refund of advances	7000.00	TA	5000.00
Grant received 2010-11	1500000.00	Field Asstt	157300.00
		Vehicle Hiring	508037.00
		Purchase of Radio Collars	271378.00
		Satellite Data acquiring Charge	0.00
		Purchase of 1 GPS.1 mRange Finder,2	709737.00
		Misc/Contingency	129042.00
		Bank Balance A/C No 50545	264934.00
G. Total	**2193071.00**	**G. Total**	**2193071.00**

Integrated Development of Wildlife Habitats
Receipt & Payment
For the period of 01-04-2010 to 31-03-2011

Receipt	Amount	Payment	Amount
Opening Balance	0.00	Fellowship & Wages	91837.00
Grant Received	400,000.00	Office Equipment	5904.00
Intt. Received	11,270.00	Contigencies	13700.00
		Advance for Expenses	25500.00
		Expenditure Total	136,941.00
		Bank Balance A/c No.51240	274,329.00
G. Total	**411,270.00**	**G. Total**	**411,270.00**

ISRO-GBP Project on LULC Dynamics
Receipt & Payment
For the period of 01-04-2010 to 31-03-2011

Receipt	Amount	Payment	Amount
Opening Balance	0.00	Travel Expenditure	6521.00
Grant Received	760,000.00		
Intt. Received	15,183.00		
		Advance for Expenses	70292.00
		Expenditure Total	76,813.00
		Bank Balance A/c No. 51241	698,370.00
G. Total	**775,183.00**	**G. Total**	**775,183.00**

WII-Monitoring Land-Use by Wildlife. Livestock and Human
in Khangchendzonga Biospheres Reserve
Receipt & Payment for the period of 01-04-2010 to 31-03-2011

Receipt	Amount	Payment	Amount
Opening Balance	0.00		
Grant Received	512,000.00		
Intt. Received	8,101.00		
		Expenditure Total	0.00
		Bank Balance A/c No. 51411	520,101.00
G. Total	**520,101.00**	**G. Total**	**520,101.00**

Receipt & Payment, For the Year 2010-11
Impact of Global Changes on Species Composition in Western HIMALAYAS:HP [A/c 51164]

Receipt			Payment		
S.No.	**Particulras**	**Amount**	**S.No.**	**Particulras**	**Amount**
1	Opening Balance	442800.00	1	Fellowship	118546.00
2	Interest credited by Bank	6366.00	2	Travel	8417.00
3	Interest credited by Bank	6198.00	3	Wages	8590.00
4			4	Equipment	12490.00
5			5	Contingencies	840.00
6			6	Cash at Bank	306481.00
	Total	**455364.00**		**Total**	**455364.00**

Receipt & Payment
GIR Lion Project
For the Period wef 01.04.2010 to 31.03.2011

Receipt	Amount	Payment	Amount
Opening Balance	1588.00	Expenses	0.00
Interest received 2010-11	57.00	Bank Balance A/C No 50572	1645.00
G. Total	**1645.00**	**G. Total**	**1645.00**

Receipt & Payment
Radio Collaring of Tigers in Sunderbans Tiger Reserve
For the Period wef 01.04.2010 to 31.03.2011

Receipt	Amount	Payment	Amount
Opening Balance	2015027.00	FA	0.00
Grants received 2010-11	300000.00	TA	10000.00
Interest Received 2010-2011	60456.00	Fellowship & Wages	461088.00
Refund of advances	15000.00	Veh & Boat hiring	347391.00
		Equipment	0.00
		Travel	45148.00
		Contingencies	92421.00
		Bank Balance A/C No 50546	1434435.00
G. Total	**2390483.00**	**G. Total**	**2390483.00**

Receipt & Payment, Ecological Monitoring of Tiger Population in Panna Landscape (M.P.)
For the Period wef 01.04.2010 to 31.03.2011

Receipt	Amount	Payment	Amount
Opening Balance	493714.00	FA	90000.00
Grants Received 2010-2011	4754000.00	TA	25000.00
Refund of Advances	138255.00	Fellowship	318845.00
Interest received 2010-2011	73581.00	Wages	147087.00
		V/Hiring	686221.00
		Contingency	89452.00
		GPS Collars & Satellite	547714.00
		Equipment	68610.00
		Bank Balance A/C No 50908	3486621.00
G. Total	**5459550.00**	**G. Total**	**5459550.00**

Receipt & Payment, Development of appropriate techniques for minimizing man-animal conflicts
For the Period wef 01.04.2010 to 31.03.2011

Receipt	Amount	Payment	Amount
Opening Balance	116098.00	FA	0.00
Grant received 2010-11	328200.00	TA	0.00
Interest received 2010-11	2862.00	Cost of man-days of the team for accomplishing the assigned task	0.00
		Engagement of Research/Field personnel, Field Asstt., Wildlife Biologist	126950.00
		Cost of TA and DA for travel in field areas in Gujarat	146504.00
		Cost of physical inputs/services/utilities/ consumbals/ components/raw materials etc	0.00
		Cost of equipment procured/computer usage	0.00
		contingencies	23705.00
		Intellectual fees as per Institute's consultancy rules approve by MOEF	0.00
		Service Tax @ 10.30%	30648.00
		Bank Balance A/C No 50710	119353.00
G. Total	**447160.00**	**G. Total**	**447160.00**

Receipt & Payment, Radio Telemetry Monitoring of Source Population of Tigers in Kanha T R
For the Period wef 01.04.2010 to 31.03.2011

Receipt	Amount	Payment	Amount
Opening Balance	4431802.61	FA	0.00
Interest Received 2010-2011	144688.00	TA	5000.00
Refund of Advances	25000.00	Travel	19491.00
		GPS/Sat Collars	175.00
		Satellite	2000.00
		Drugs & eqpt	139446.00
		Collared Tiger	0.00
		Genetic Study	235606.00
		POL	53470.00
		Fellowship/Wages	336014.00
		Contingency	44010.00
		Bank Balance A/C No 50685	3766278.61

Receipt & Payment, Okhala Bird Sanctuary Management Plan
For the period wef 01.04.2010 to 31.03.2011

Receipt	Amount	Payment	Amount
Opening Balance	1298625.00	Project Personnel (3)	288871.00
Interest Received 2010-2011	37318.00	Hiring of Boat with boat man @ 15000 for 3 months	11320.00
Refund of Advances	11000.00	Vehicle hire @ 15000 for 6 months	89019.00
		Travel cost for the project personnel including DA	96840.00
		Stationary including CD and other office equipment	1759.00
		Workshop	49958.00
		Equipment and accessories (to be handed over to the forest department after completion of the plan)	90131.00
		Contingency & unforeseen expenditure	10774.00
		Bank Balance A/C No 50885	708271.00
G. Total	**1346943.00**	**G. Total**	**1346943.00**

Conservation of the Endangered Asiatic Wild Dog Cuon Alpinus in Western Arunachal Pradesh : Linking Ecology Ethnics & Economics to Foster better Coexistence
Receipt & Payments, For the period of 01.04.2010 to 31.03.2011

Receipt	Amount	Payment	Amount
Opening Balance	618712.00	Fellowships	288000.00
Interest received 2010-11	23624.00	Consumeable	117063.00
Grants received	700000.00	Travel	141051.00
		Contingencies	62649.00
		Equipment	205839.00
		Wages to Field Assistants	108000.00
		Advances Paid	18000.00
		Bank Balance A/C No - 50672	401734.00
G. Total	**1342336.00**	**G. Total**	**1342336.00**

Project Tiger Co-predator, Prey & Habitat Phase IV
Receipt & Payments
For the period of 01.04.2010 to 31.03.2011

Receipt	Amount	Payment	Amount
Opening Balance	1912670.00	Fellowships	144000.00
Interest received 2010-11	64280.00	Consumeable	14403.00
Refund of TA (Ms Shikha Bisht, JRF)	3000.00	Travel	110333.00
		Contingencies	30067.00
		Wages to Field Assistants	58940.00
		Bank Balance A/C No - 50673	1622207.00
G. Total	**1979950.00**	**G. total**	**1979950.00**

Macroecology of the Terrestrial Herpetofauna in Andaman & Nicobar Archipelago
Receipt & Payments
For the period of 01.04.2010 to 31.03.2011

Receipt	Amount	Payment	Amount
Opening Balance	689122.00	Fellowships	312000.00
Interest received 2010-11	16747.00	Consumeable	25287.00
Refund of advances (25000+2664+1302)	28966.00	Travel	62558.00
		Equipment (Overhead)	78329.00
		Wages to Field Assistants	9000.00
		Advances Paid	60000.00
		Bank Balance A/C No - 51031	187661.00
G. Total	**734835.00**	**G. total**	**734835.00**

WII - All India Tiger Estimation Project
Receipt & Payment
For the Period wef 01.04.2010 to 31.03. 2011

Receipt	Amount	Payment	Amount
Opening Balance	947,151.00	Equipment (Camera Trap, Compass, Range Finder, Binoculars, GPS, Computers, Software etc.)	12,707,371.00
Grant Received	64,736,000.00	Contractual tech for data collection	8,538,041.00
Interest Received	265,348.00	Vehicle hiring for data collection	5,273,185.00
		Wages for field assistant	786,753.00
		Travel exp (including International for Conferences)	1,247,970.00
		Training Workshop (Six)	160,852.00
		GIS Staff (Contructual for Data Analysis)	942,848.00
		Pub & Trg material	887,919.00
		Total expenses	30,544,939.00
		Loan Refund	3,000,000.00
		Forest Advance	210,229.00
		Tour Advance	97,188.00
		Grant Total	33,852,356.00
		Bank UBI-50968	32,096,143.00
G. Total	**65,948,499.00**	**G. Total**	**65,948,499.00**

Procurement of Satellite and VHF Collars for study of tiger behaviour
From 01.04.2010 to 31.03.2011,
Receipt & Payments, For the period wef 01.04.2010 to 31.03.2011

Receipt	Amount	Payment	Amount
Opening Balance	513202.00		0.00
Interest received 2010-11	18206.00		0.00
			0.00
		Bank Balance A/C No 50709	531408.00
G. Total	**531408.00**	**G. Total**	**531408.00**

Housing & Enclosure Enrichment of Some Species in selected Indian Zoos
Receipt & Payments
For the period of 01.04.2010 to 31.03.2011

Receipt	Amount	Payment	Amount
Gerant Received from Central Zoo Authority, New Delhi	1900000.00	Fellowships	74089.00
Interest received upto Mar 2011	96055.00	Consumeable	0.00
		Travel	5780.00
		Contingencies	5293.00
		Bank Balance A/C No - 50912	1910893.00
G. Total	**1996055.00**	**G. total**	**1996055.00**

Diversity and conservation of endangered fish genetic resources of Kalakad Mundanthurai Tiger Reserve, Tamilnadu"
Receipt & Payments, For the period of 01.04.2010 to 31.03.2011

Receipt	Amount	Payment	Amount
Grant Received Ministry of Science & Technology	459000.00	Fellowships	48774
Interest received upto 2010-11	20164.00	Consumeable	29149
		Travel	21955
		Contingencies	3824
		Equipment	61979.00
		Bank Balance A/C No - 50982	313483.00
G. Total	**479164.00**	**G. Total**	**479164.00**

Ecology of Leopard Panthera Pardus in Relation to Prey Abundance & Land Use Pattern in Kashmir Valley
Receipt & Payments, For the period of 01.04.2010 to 31.03.2011

Receipt	Amount	Payment	Amount
Grant Received Ministry of Science & Technology (DST)	2100000.00	Fellowships	86710.00
Interest received 2010-11	32804.00	Consumeable	3433.00
		Travel	52086.00
		Contingencies	25020.00
		Equipment	110853.00
		Wages to Field Assistants	35880.00
		Advances Paid	6000.00
		Bank Balance A/C No - 51480	1812822.00
G. Total	**2132804.00**	**G. Total**	**2132804.00**

Ecological Assessment of Banj Oak Forests in Kedarnath Wildlife Sanctuary, Western Himalaya with reference to invasion by Pine
Receipt & Payments, For the period of 01.04.2010 to 31.03.2011

Receipt	Amount	Payment	Amount
Gerant Received Ministry of Science & Technology (DST)	600000.00	Fellowships	118065.00
Interest received 2010-11	7994.00	Consumeable	100.00
		Travel	26400.00
		Contingencies	3500.00
		Bank Balance A/C No - 51671	459929.00
G. Total	**607994.00**	**G. Total**	**607994.00**

Hydro Electrical Project
Receipt & Payment
For The Period of 03 Jan 2011 To 31 Mar 2011

Receipt	Amount	Payment	Amount
Fund received	3,163,000.00	Forest Advance	75,000.00
Intrest on Saving Account	1,749.00	Tour Advance	7,000.00
		Manpower	265,892.00
		Travel	6,743.00
		Hiring of vehicle	26,228.00
		Procurement of specialized service	0.00
		Development of Spatial Database	26,386.00
		Establishment and Operation of base-camp	47,956.00
		Field Equipment	26,224.00
		Mizc	2,469.00
		Bank UBI-50968	2,680,851.00
G. total	**3,164,749.00**	**G. Total**	**3,164,749.00**

NNRMS Maping Project (A/C No. 518502010000052) Wildlife Institute of India, Dehradun,
Receipt & Payment
Accounts For Year 2010-2011

Receipt		Payment	
Particulars	**Receipt**	**Particulars**	**payment**
Opening Balance	2,133,996.00	Misc. expenses	8,100.00
Interest received	74,964.00		
		By Closing Balance (cash)	16,608.00
		By Closing Balance (Bank)	2,184,252.00
'F' G. Total	**2,208,960.00**	**'F' G. Total**	**2,208,960.00**

WII-Building Partnership to Support UNESCO World Heritage Programme
Receipt & Payment
for the period of 01-04-2010 to 31-03-2011

Receipt	Amount	Payment	Amount
Opening Bal.	1,827,297.40	Fellowship and Wages	913,932.00
Grant Received	3,356,182.80	Travelling Expenses	1,015,340.00
Intt. Received	73,204.00	Scholarship	750,000.00
		Training & Workshop	554,623.00
		Office Equipment	143,272.00
		Equipment	637,659.00
		Base Camp Expenditure	49,250.00
		Mpas	23,163.00
		Advance for Expenses	200,278.00
		Printing	132,190.00
		Data Collection	65,000.00
		Misc. & Contigencies	564,025.00
		Boarding & Lodging	16,615.00
		Expenditure Total	5,065,347.00
		Bank Balance A/c No. 50246	191,337.20
G. Total	**5,256,684.20**	**G. Total**	**5,256,684.20**

WII-ENVIS Project
Receipt & Payment, For the Period of 01-04-2010 to 31-03-2011

Receipt	Amount	Payment	Amount
Opening Balance	314,951.75	Fellowship and Wages	353,050.00
Intt. Received	15,377.00	Travelling Expenditure	50,093.00
Grant Received	643,887.00	Contingency	100,809.00
		Printing ENVIS	227,682.00
		Telemetry Workshop	31,530.00
		Expenditure Total	763,164.00
		Bank Balance A/c No. 32	211,051.75
G. Total	**974,215.75**	**G. Total**	**974,215.75**

(P.K. Aggarwal)
Finance Officer

(P.R. Sinha)
Director

WILDLIFE INSTITUTE OF INDIA
P.O. Box # 18, Chandrabani
Dehradun - 248 001 (Uttarakhand)
t. (0135) 2640111-115; **f.** 0135-2640117
w. www.wii.gov.in; **e.** wii@wii.gov.in