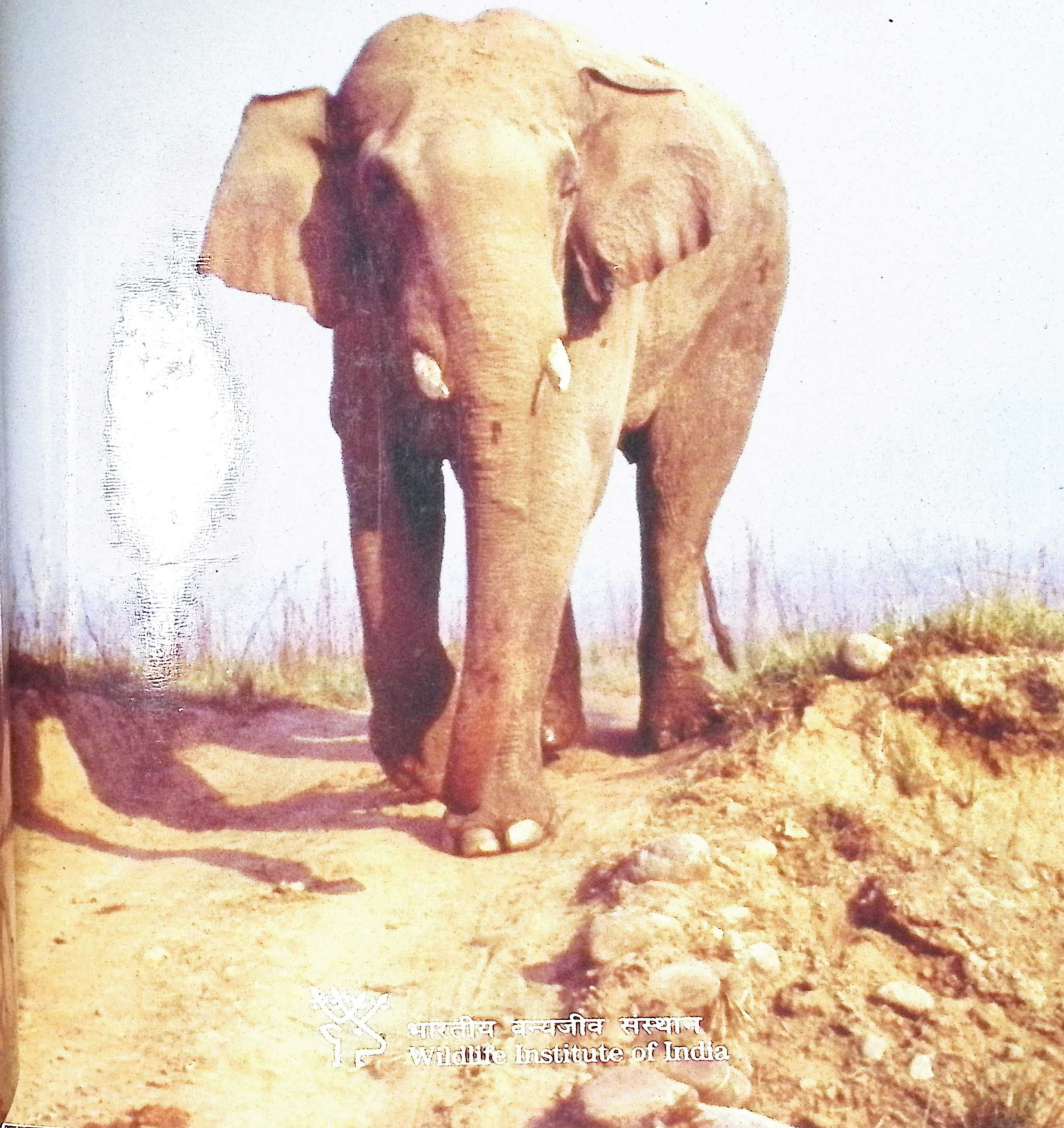


ANNUAL REPORT

1996 - 97



भारतीय वन्यजीव संस्थान
Wildlife Institute of India

CONTENTS

Director's Note	2
Year at a Glance	3
Main Work Programme 1996-97	4
Background	5
Objectives	6
Institutional Infrastructure	7
Academic	9
Training Programmes	9
Short Courses	10
Education Programme	13
Workshops, Seminars, Conferences	14
Courses, Training and Study Tours	20
Research	22
Ongoing Projects	22
Projects Initiated	35
International Collaboration	37
Organization	48
Development	48
Service and facilities	49
Perspective 1997-98	58
Publications	59
Members	61
Audit Report	64

DIRECTOR'S NOTE

With the completion of 1995-96 fiscal year, WII completed a decade of autonomy. The year 1996-97 has been critical in terms of its sustenance and meeting new challenges in the attainment of its goals. At the same time, the year has also witnessed increasing recognition and importance of WII as a training and research centre, both in the country and in the South Asia region.

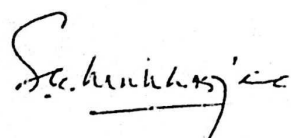
Of late, the financial state of the institute has not been very comfortable. As a result, the next phase of the building programme had to be postponed, and the manpower requirement was partially fulfilled by engaging personnel on contractual basis. However, despite these odds, the work plan approved by WII's Governing Body was completed with the desired degree of satisfaction.

On the recommendations of an external reviewer, the FAO/UNDP project for Ecodevelopment Planning and Management Planning courses was granted a six month extension beyond December 1996. The institute was also asked to submit a further proposal for implementing at least two plans developed under the current project.

Significant achievements were also made in WII's collaborative work funded by US Fish & Wildlife Service and US Forest Service under Indo-US Sub-Commission on Science and Technology. WII's collaborative work with the State Forest Departments of Gujarat, Rajasthan, Kerala, Madhya Pradesh, Himachal Pradesh, Tamil Nadu and West Bengal on GEF/World Bank funded projects is progressing as per the agreed schedule despite time constraints and non-settlement of the financial terms for the projects in Himachal Pradesh and Tamil Nadu.

WII participated in the Indian scientific expedition to Antarctica for the third year running. In fact, encouraged by the appreciation of WII's work both in the country and outside, this year we sent two participants.

Overall, the year 1996-97 has been very productive in terms of output and achievement of the objectives. This was made possible, as always, due to the hard work and dedication of the faculty and staff members.



SK MUKHERJEE

YEAR AT A GLANCE

Set up in 1982 and granted autonomy in 1986, the Wildlife Institute of India is now well established and recognized as a premier institution involved in research, teaching and training of wildlife management, wildlife science and biodiversity conservation. Like most previous years, 1996-97 was also a busy one.

Last year, the diploma course was restructured to have a modular format so as to cater to the specific training needs of the state forest departments. The XVII diploma course, completed in May 1996, was the first to be conducted under the new format and had a module on "Ecodevelopment" for which lateral entries were allowed. Among the short courses, the one on zoo management held this year was for senior level zoo personnel, and the course on interpretation and conservation education had interesting additions such as puppetry, origami and use of natural objects such as horns, antlers, etc. to its curriculum.

Workshops and seminars organized in 1996-97 were on important topics such as landuse and biodiversity conservation, elephant conservation and management, illegal wildlife trade, wildlife management for SAARC countries, and environmental impact assessment, amongst others. The 10th Annual Research Seminar saw 28 presentations based on 16 ongoing and nine completed projects.

Research is a major agenda of WII. The Research Advisory Committee (RAC) responsible for guiding WII's research activities was restructured this year and is now called the Training, Research and Academic Council (TRAC). WII continued to participate in the summer expeditions to the Antarctica and, in fact, this year sent two faculty members. The second phase of the WII-FWS collaboration is now well settled and work on seven projects are under satisfactory progress. Work on two other projects, under World Bank funding, also continued uninterrupted even in the absence of funding during the entire year (but which eventually arrived in April 1997).

WII's collaboration with UNDP which aimed to strengthen wildlife management and ecodevelopment planning capabilities within Union and State wildlife agencies was to complete this year in December 1996, but has been granted a six-month extension.

The institute extends technical and advisory support to the Environment Division of the Ministry of Environment and Forests in matters relating to the environmental impact assessment of development proposals, and is equally sought after for this by the private sector. This year, consultancy services have also been provided to the West Bengal state government under World Bank aided forestry projects on elephant conflict and rhinoceros management.

All the departments and sections of the institute viz. computer, library, laboratory, audio-visual etc. continued to make the required progress.

MAIN WORK PROGRAMME 1996-97

REGULAR TRAINING COURSES

- XVII PG Diploma Course (September 1995 - May 1996)
- XVIII PG Diploma Course (Commenced in September 1996)
- V M.Sc. (2 years, started in July 1995)
- XII Certificate Course (May-July 1996)

SHORT COURSES

- Capsule Course for IFS officers (September 1996)
- Capsule Course for IFS Officers (December 1996)
- Capsule Course for Zoo Directors (December 1996)
- Interpretation and Conservation Education (March 1997)

WORKSHOPS

- Planning Workshop - WII-USFS project : Management of Forests in India for Biological Diversity and Forest Productivity - An Ecological Perspective (June 1996)
- Action Plan for the Conservation and Management of Elephants in India (June 1996)
- Curriculum Development of the Diploma Course in Wildlife Management (June 1996)

- Application of GIS and Remote Sensing in Wildlife Management (August 1996)
- Wildlife Management for SAARC Countries (October 1996)
- Control of Illegal Wildlife Trade in India (November 1996)
- GOI-UNDP project : Strengthening Wildlife Management and Ecodevelopment Planning Capabilities (November 1996)
- Current Trends and Practices in Environmental Impact Assessment (December 1996)
- Integrated Forestry Programme to Support Biodiversity Conservation (January 1997)

SEMINARS

- Landuse and Biodiversity Conservation (June 1996)
- Annual Research Seminar (September 1996)
- Wildlife Research Needs in Madhya Pradesh (February 1997)

CONSULTANCIES - WORLD BANK AIDED FORESTRY PROJECTS

- Elephant Management - West Bengal
- Special Studies on Rhino - West Bengal
- GEF - India Ecodevelopment Project

BACKGROUND

In the last half century, India's once rich biodiversity has become considerably depleted. Rapid human and livestock population increase and a rather lopsided distributive development pattern have marginalized or unjustly exploited the country's bountiful wilderness areas so that the species richness and the range of habitat types that the country used to boast is today highly eroded and fragmented. How can this fall be checked and reversed is now a question being pondered over at most forums.

This sense of introspection is an encouraging sign indeed. There are some other encouraging signs as well. For instance, the forest departments, the custodians of forests in the country, no longer see their custody as purely industrial raw material but a vital cog in the ecological wheel for the ultimate and sustained well being of humanity. Such a realization will, in the long run, help overcome the shortcomings and failures of early protective measures to preserve wilderness areas, which still remain among the most effective ways of conserving the country's biodiversity.

Amidst such a situation, a need was felt for an organization to help and strengthen the endeavours for recovery. It was important to have an agency which, while looking at forests holistically, would combine their management with conserving their biodiversity and protecting the interests of the people living in their vicinity in a manner that would be practical and scientifically sanctioned. Such a thought process led to the setting up of Wildlife Institute of India (WII) at Dehra Dun in 1982 with a mandate to train government and non-government personnel, carry out research, and advise on matters of conservation and management of wildlife resources.

For WII, it was a challenging task, particularly when education of forest management had nothing on wildlife, and wildlife science itself had not yet been established as a subject of any significance in the university education

curriculum. With no precedence to go by, WII had to virtually single handedly not only give forest education a wildlife slant but also create and develop the very resources with which it could go about its tasks.

This apparent disadvantage ultimately became the institute's strength because the freshness of approach gave it a strong foundation and prevented its programmes from becoming mere academic exercises. WII's programmes are field based and seek an integration of biological, socio-economic and human aspects of large regional landscapes. As a result, wildlife conservation today means not just providing protection mainly to a few splendid species but that it be holistic and have consideration for humans living in the vicinity as well.

WII's research projects being conducted in field sites across the length and breadth of the country are the primary sources of scientific information to help conservation. They are also the means of keeping the institute's faculty abreast of current field situations and the latest technology.

In its endeavours, WII has had the benefit of international and bilateral collaborations for institutional building, faculty development, infusion of modern technology and creation of a scientific infrastructure. These collaborations are worked out with wildlife organizations, scientific institutions and universities at the national level as well.

WII was accorded autonomy in April 1986, which furthered its pace of growth. With many countries in south and south-east Asia region regularly sending their personnel to its training programmes, WII is already considered an important regional centre for training and education in wildlife management and conservation.

OBJECTIVES

In seeking to fulfil its mandate, WII has set itself the following tasks :

- Train managers and biologists for protected area management and wildlife research;
- Train education and extension specialists for protected areas so as to get public support for wildlife conservation;
- Provide orientation courses for those involved in landuse management;
- Conduct and coordinate applied wildlife research and evolve relevant techniques suited to Indian conditions;
- Create a database for building up a wildlife information system employing modern computerized analytical techniques; and
- Provide advisory and consultancy services to central and state governments, universities, research institutions and other official and non-official agencies.



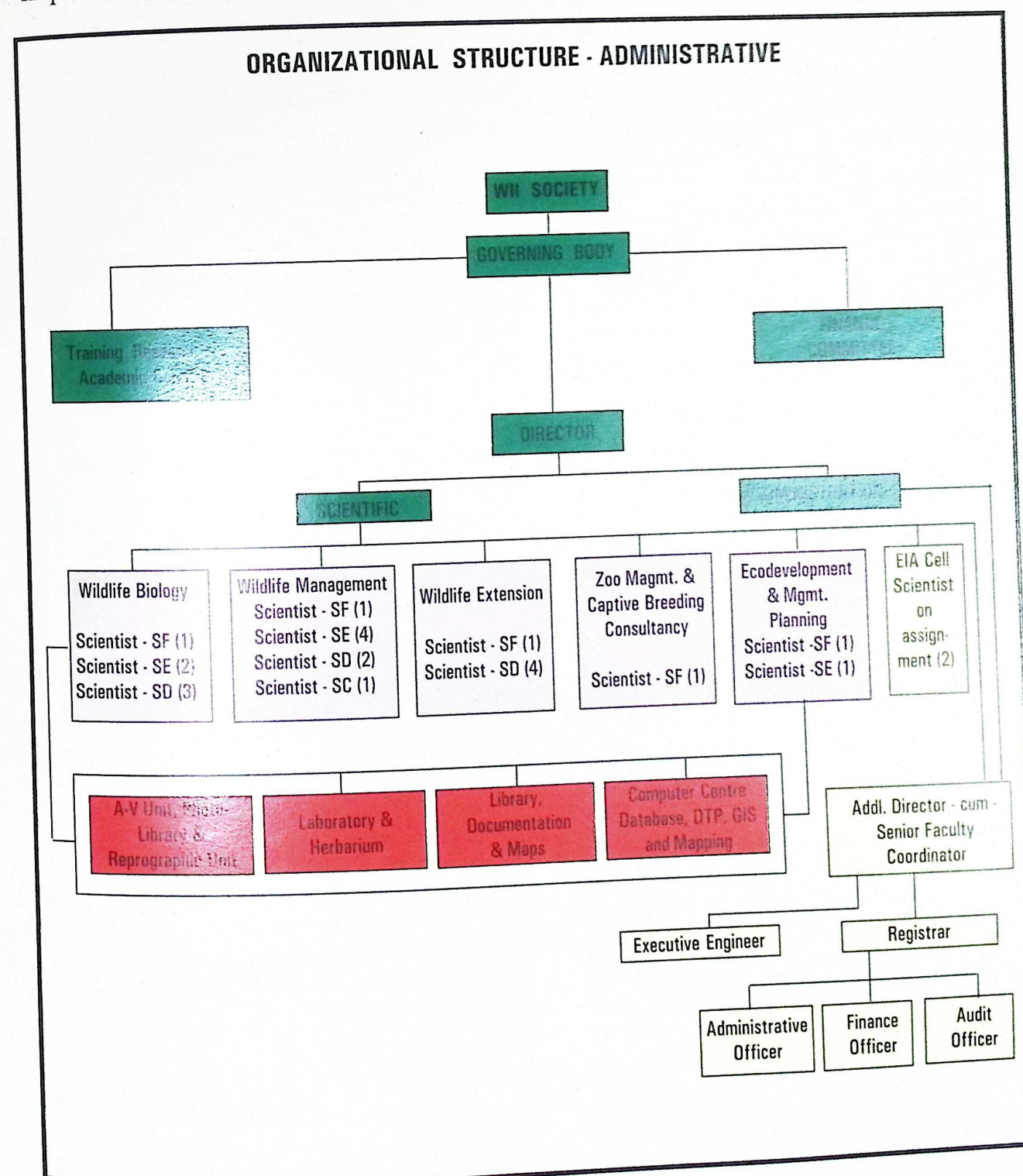
GS Rawat

Dicanthus angulatus in Pin Valley National Park

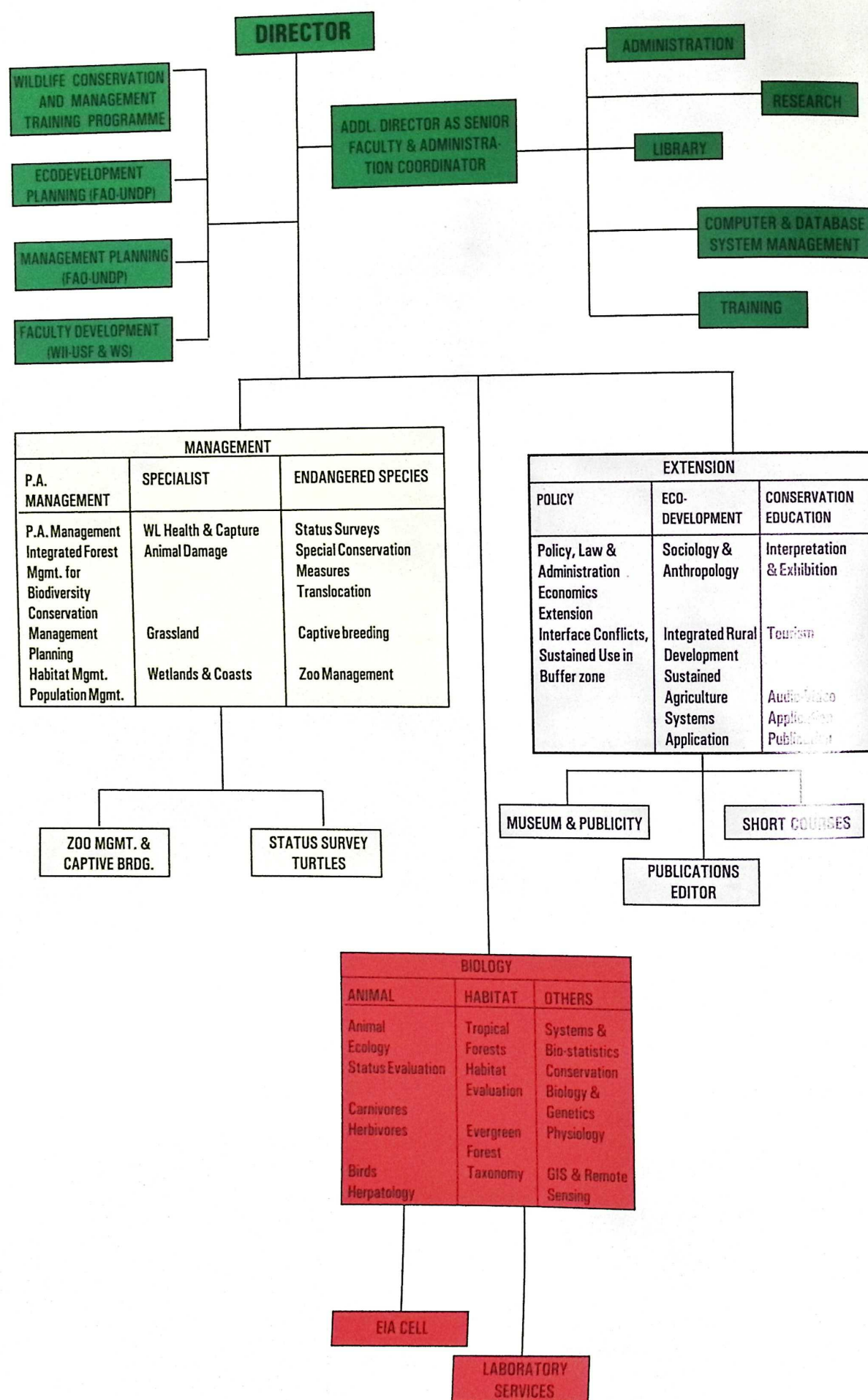
INSTITUTIONAL INFRASTRUCTURE

There are three faculty divisions in WII - Wildlife Biology, Wildlife Management and Wildlife Extension. There are two other units - Ecodevelopment Cell to handle programmes in "ecodevelopment and management planning" and internationally aided projects; and EIA Cell which undertakes consultancies in mandatory preview of the impact of proposed industrial or other

developmental projects on forests and wildlife. These faculty divisions and cells are ably supported by well equipped Library and Documentation Centre, Computer Centre, Laboratory and an Audio-Visual Unit. The charts below detail WII's organizational structure.



ORGANIZATIONAL STRUCTURE - SCIENTIFIC



ACADEMIC

TRAINING PROGRAMMES

Post-Graduate Diploma Course in Wildlife Management

Last year, the 9-month diploma course was restructured and was changed from its conservative two-term format to a modular format. Under the new format, the course is now run on sixteen distinct modules wherein, besides the earlier subject disciplines in Wildlife Biology, Wildlife Management and Wildlife Extension, there are module topics such as Environment Impact Assessment, Wetland and Marine Coastal Area Management, Ecodevelopment for Biodiversity Conservation.

The change was effected to facilitate and cater to the specific training needs of the State Forest Departments. The new format allowed lateral entry for short-term training in specific, individual modules, e.g. one-month module on "Ecodevelopment for Biodiversity Conservation" for ACF/DCF level officers. Under the new format, the performance of the officers trainees is assessed by the respective Module Coordinators under the categories of class interaction, small assignment, short

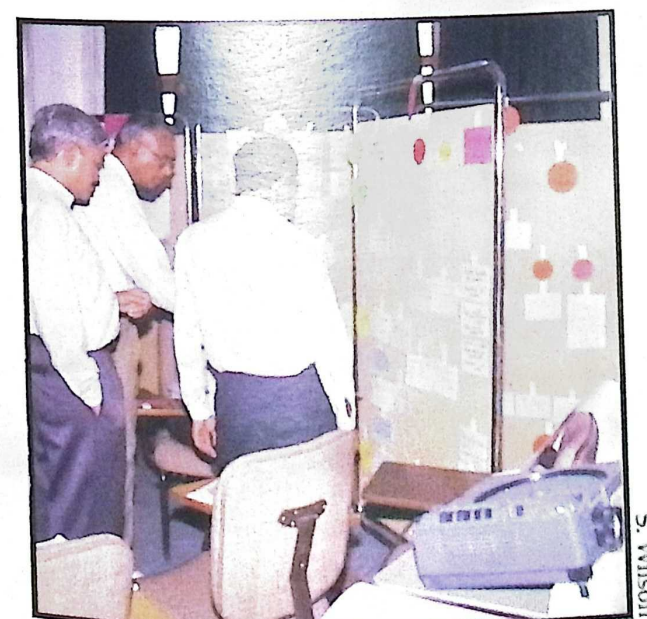
seminars, quiz, brief/objective tests, group discussions and practical tests.

The XVII Diploma Course, which started in September 1995 and was completed on 31 May 1996 was the first to be organized under the new modular format. This batch had a module on "Ecodevelopment" for which lateral entries were allowed. Besides the 15 regular trainees in the existing diploma course, there were 11 others to specially attend this month long module.

At the completion of the XVII course, of the 15 officers trainees (14 forest officers and one veterinary officer) from different States in the country, the top honour and the Institute Gold Medal were awarded to A Udhayan from Tamil Nadu. Awards for other outstanding performances were given to Samir Sinha (Uttar Pradesh) and RS Sikarwar (Madhya Pradesh).

The XVIII course commenced on 1 September 1996. The participants include 14 forest Officers from different States/UT within the country, one veterinarian from CCU Haryana Agriculture University, Hissar, three from Bangladesh sponsored USAID under sponsored by WII-FWS Project, one from Nepal under SAARC fellowship and one Malaysian from Sabah Wildlife Department, Malaysia.

Most of the modules have been completed so far and four field tours have been conducted - (a) Orientation Tour - one week at Sariska Tiger Reserve (Rajasthan); (b) Techniques Tour - two weeks at Beribada in Rajaji National Park (Uttar Pradesh); (c) Wildlife Health Tour - one week to IVRI at Bareilly and Mukteshwar (both Uttar Pradesh); and (d) Management Tour - five weeks in different protected areas around the country, including a term paper writing exercise in Gir national park (Gujarat). A final two-week Management Plan Tour would be organized to Tadoba national park (Maharashtra) in April-May 1996, wherein following field exercises, the trainees will write their test management plans.



Trainees at a workshop during the Ecodevelopment module as part of their Diploma Course in Wildlife Management

Certificate Course in Wildlife Management

The XII Certificate Course in Wildlife Management for in-service Forest Range Officers and others of equivalent rank started on 1 May 1996. In all, 16 officers trainees, representing 10 States/UT received training in basic wildlife biology and field techniques for the scientific management of protected areas including the all-important human dimensions in this course.

Classroom teaching was based on a course unit system and all three faculties of the Institute - viz Wildlife Biology, Wildlife Management and Wildlife Extension were involved in imparting training/teaching. Much time was devoted to practical work both on campus and on field tours. The performance of the trainees was assessed by theoretical examinations and practical evaluations based on the field projects.

Two field visits were also undertaken -

(a) *Orientation/Techniques Tour* to Rajaji National Park; (b) *Management Tour* to Dudhwa National Park, Kishanpur Wildlife Sanctuary (both Uttar Pradesh), Delhi Zoological Park and national catchment area,

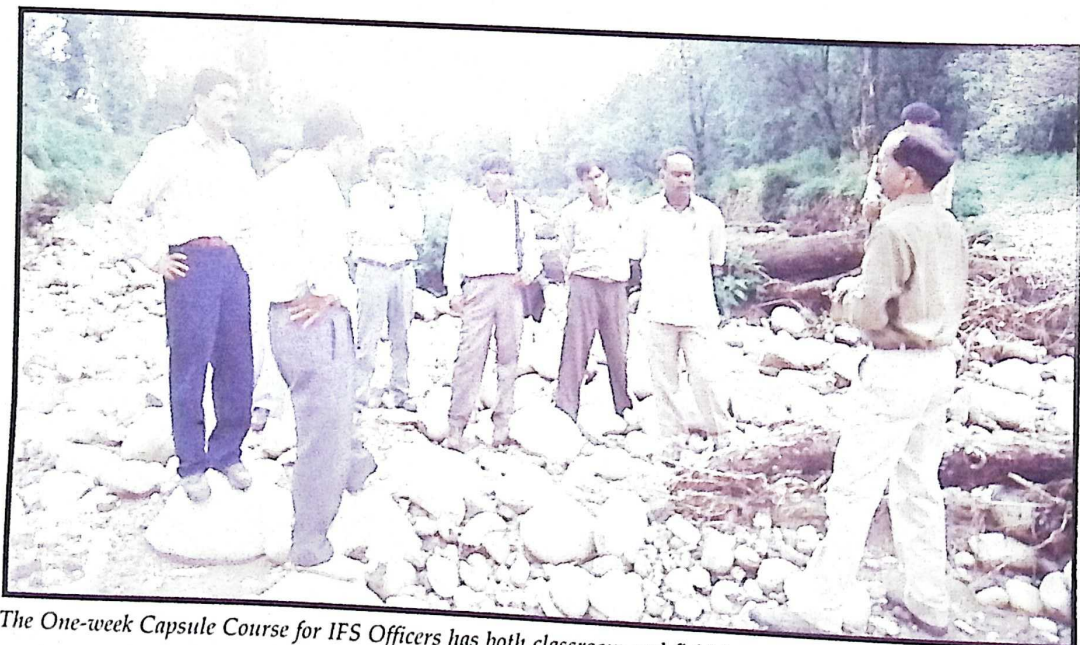
and Kufri manali nature park, Great Himalayan National Park (Himachal Pradesh), Nanda Devi Biosphere Reserve (Uttar Pradesh).

The course concluded on 31 July 1996. The Wildlife Conservation Silver Medal for the 'top trainee' was bagged by CS Dubey from Madhya Pradesh. In addition, two institute prizes for excellent performances were given to AK Acharya (Orissa) and Gautam Debbarma (Tripura).

SHORT COURSES

Capsule Course in Wildlife Management for IFS Officers

Two courses, conducted regularly by WII, are sponsored by the Ministry of Environment & Forests, GOI under its compulsory training programme for senior IFS officers, at Chandrabani, Dehra Dun. The one-week course this year was scheduled to be held in May, but had to be postponed because of the Lok Sabha elections. It was subsequently conducted in the first week of September (2-6 September 1996) at the WII campus where the participants could avail the best modern classroom, computer and library facilities. In all, 15 participants from eight States attended the course.



The One-week Capsule Course for IFS Officers has both classroom and field inputs

S. Wilson

The overall objective of this short course was to orient the participants to the critical issues in protected area management and the plausible strategies to mitigate the problems. Altogether, 15 sessions were held including interactive and participatory discussion sessions, audio-visual programmes and a field visit to the Chilla part of the Rajaji National Park. A new addition to the course curriculum this year was one complete session on "Wetland Management" and a lecture on "Externally Aided Projects". Relevant reading material on subjects covered were supplied to the participants.

The second course under this compulsory training programme is of three weeks duration and was targeted to officers working as or soon to be posted as managers in protected areas, who have not received any formal training in Wildlife Management. The objectives of this course are to acquaint the participants with the basics in wildlife biology and management; the critical issues and plausible strategies in PA management; interface conflicts, their causes and an ecodevelopment approach to mitigate these problems; concern for conservation of biodiversity in forests other than PAs without adversely affecting the main forestry objectives; and working with local communities to achieve the above in order to ensure effective conservation of biodiversity.

At the course held this year (2-20 December 1996) there were eight participants from Bihar, Karnataka, Kerala, Maharashtra and Tripura. Resource persons included WII faculty members and a number of guest speakers from Indira Gandhi National Forest Academy, Indian Institute of Remote Sensing, Forest Survey of India, and UP Watershed Project Department and environmentalists.

Participants visited Forest Survey of India and FRI, and were also taken to Rajaji National Park and Corbett Tiger Reserve to have an interactive session with the park management.



Vinod Verma

Chemical restraint techniques is among the subjects dealt with during the 3-week Capsule Course for IFS Officers.

Zoo Management,

10-20 December 1996

For some years now, WII has been conducting "Endangered Species and Zoo Management Course" every year, alternately for senior zoo professionals like zoo directors and for middle level zoo managers. While the course for the former provides an exposure on the emerging modern concepts in zoo management and largely focuses on policy level issues; for the latter, the course is more practically oriented with emphasis on techniques involved in the day-to-day management of captive animal facilities. The course this year, the seventh in the series, was for zoo directors and held at Bhubaneswar (Orissa) in collaboration with the Nandankanan Biological Park there. It was sponsored by the Central Zoo Authority.

There were 17 participants from 13 states attending the course, representing captive animal facilities managed by forest departments, autonomous bodies and non-governmental organizations. The resource persons included seven zoo professionals and two faculty members from WII. There were classroom lectures, discussions and practical sessions, besides presentations by participants on their captive animal facilities. A study tour

was organized to Indira Gandhi Zoological Park, Vishakapatnam, and heritage tours to Balukhand sand-dune blackbuck sanctuary and the Astarang marine turtle arribada site. There were various suggestions from the participants on conducting training programmes on specialized themes such as zoo master planning, zoo architecture, collaborative breeding programmes, health and hygiene, visitor management, education and interpretation programmes, etc. Possibly one of such topics will be taken up at the next course, which would be for middle level zoo professionals.

Interpretation and Conservation Education Course

10-19 March 1997

Interpretation and conservation education have become important tools for generating environmental awareness. However, in the absence of trained personnel there are hardly any systematic and meaningful environmental awareness generating programmes and activities for the visitors to protected areas and zoos and the public at large.

It is towards meeting this shortcoming that WII conducts this course on "Interpretation and

Conservation Education". The objectives are to orient the participants to appreciate the need for environmental awareness and education and understand the value of using basic interpretive principles in disseminating conservation awareness and the use of interpretation as a management tool. The course also seeks to expose them to a range of communication techniques and provide them minimal ability to pass on the acquired skills and knowledge to others.

At the course held this year there were 12 participants - eight from the various forest departments, one school teacher, one NGO representative and two from the travel and tourism trade. Over a 10 day period, the participants were exposed to a wide range of interpretive and conservation education techniques through classroom and guest lectures, field trips and film and slide shows. Hands-on exercises allowed them to learn and practice a number of approaches and methods in presenting ideas and information, and acquiring the skills and confidence necessary for effective communication. Three new sessions viz. use of non-conventional props like puppetry and mask making, use of natural or dead objects like horns, antlers, skin, etc. and Origami, the Japanese art of paper folding were introduced in this year's course.



The participants of the Interpretation and Conservation Education course on a field trip to Malsi Deer Park, Dehra Dun, pleasantly surprised by a pair of unexpected visitors.

Vinod Verma

EDUCATION PROGRAMME

MSc (Wildlife)

In 1988, WII started a M.Sc course in Wildlife Science. At the time, Wildlife Science was a relatively new subject in the Indian university education system. Even today only two other institutions/universities in the country offer this course. WII's initiative is to train and provide biologists and wildlife scientists to carry forward the cause of wildlife conservation in India. The current batch is the fifth to be undergoing this course.

Towards the end of the last reporting year, the batch had completed most of the theory classes as part of the IInd semester. In April 1996, the students went on a Techniques Tour (Wetlands) to Orissa. The sites visited included the mangrove forests of Bhitarkanika wildlife sanctuary, Olive ridley turtle nesting beaches in Gahirmatha and Rushikulya, and the Chilika lake. And the very next month, a Techniques Tour (High Altitude) was taken to the Kedarnath wildlife sanctuary in the Garhwal Himalaya (UP).

The IInd semester examinations - three theory papers (Wildlife Ecology, Habitat Ecology and Conservation Biology, and Quantitative Methods, Techniques and Behaviour), one laboratory test and one field practical - were held in June 1996, which were followed by a three-week summer holidays.

In the IIIrd semester, the students finalized their dissertation proposals and topics, and made presentations on their proposals before the institute faculty and other researchers. A Conservation Practice Tour was taken to Gujarat in October 1996, visiting Wild Ass sanctuary (Rann of Kachchh), Velavadar national park and Gir wildlife sanctuary and national park. The examinations for this semester were conducted in November 1996 and included one theory paper (Management and Human Ecology), one theory paper based

on optional topics (three review papers based on elective subjects the students had opted for in the subject areas of Wildlife Biology, Wildlife Management and Habitat Ecology) and one practical test.

By third week of November, as part of their IVth semester, the students left for their respective field sites to begin work on their dissertation research projects.

These projects are -

- Habitat occupancy by wild ungulates in Pench tiger reserve, MP (B Bhaskar Acharya)
- Movement patterns of radio-tagged tigers in Panna national park, MP (Abi Tamin F Vanak)
- Ecological impacts of prescribed burning in Corbett tiger reserve (Sonali Ghosh)
- Impact of teak plantations on forest butterfly communities of Parambikulam wildlife sanctuary, southern Western Ghats (Manor V Nair)
- Pollinator visitation and reproductive success in two species of mangrove plants (Shalini Pandit)
- Effect of grazing, utilization and management on the grasslands of Royal Bardia national park, Nepal (JB Karki)
- Habitat use by monal pheasant (*Lophophorus impejanus*) in winter, in Kedarnath wildlife sanctuary, Western Himalaya (R Suresh Kumar)
- A study on bird communities-habitat structure relationships in Pench national park, MP (R Jayapal)
- Extraction of non-timber forest produce from selected tree species in Betul forest division and its impact on the population structure of these species (Anupma Koliyal)

- Food selection and ranging by hoolock gibbons in Borajan reserve forest, Assam (Kashmira Kakkati).
- Food habits and foraging behaviour of Indian gazelle in Rajasthan desert (Ganesh Kodoth).

The students will complete their field work in May 1997 and thereafter write their dissertation towards the final award of MSc degree.

WORKSHOPS, SEMINARS, CONFERENCES

Organized by WII

Landuse and Biodiversity Conservation 3-7 June 1996

A national seminar on "Landuse and Biodiversity Conservation" was organized in collaboration with the Economic Development Institute (EDI) of the World Bank and the Project Tiger Directorate, Govt. of India, New Delhi.

The seminar sought to strengthen the understanding and skills of participation in assessing the economic, social and ecological effects of the landuse policies on biodiversity conservation so that such policies could be redesigned and better biodiversity conservation action plans could be implemented for environmental stability and sustainable development. There were 24 participants from various Indian states at the seminar which was coordinated by a senior personnel from the EDI, Washington along with a senior faculty member from WII. The proceedings of the seminar are being brought out jointly by the Economic Development Institute (EDI) and Wildlife Institute of India (WII).

Forest Management

8-10 June 1996

WII and US Forest Service have jointly started a project "Management of Forests in India for

Biological Diversity and Forest Productivity - An Ecological Perspective". This project, started in January 1996, seeks to evolve approaches and practices for integrated forest management which are essential for biodiversity conservation and productivity of the forest ecosystems. The project is being conducted at select sites in Meghalaya, Uttar Pradesh, Madhya Pradesh, Maharashtra and Tamil Nadu.

As the project had begun only six months ago, this planning workshop was called to provide all participating agencies an understanding of the project and its concepts. Those who participated in the workshop included representatives of the forest departments of all the five states involved, the investigators and researchers from WII, two faculty members from IGNFA and three scientists from the US Forest Service.

At the workshop the study areas and their critical issues were described; products useful to enable managers to achieve the project objectives identified; and coordination structure, monitoring and evaluation methods and procedures also identified. An action plan was prepared for the five-year duration of the project which spelled the direction for achievement of all the project objectives. Also, the project budget was reviewed and a revised budget proposed.

Elephant Conservation and Management

13-15 June 1996

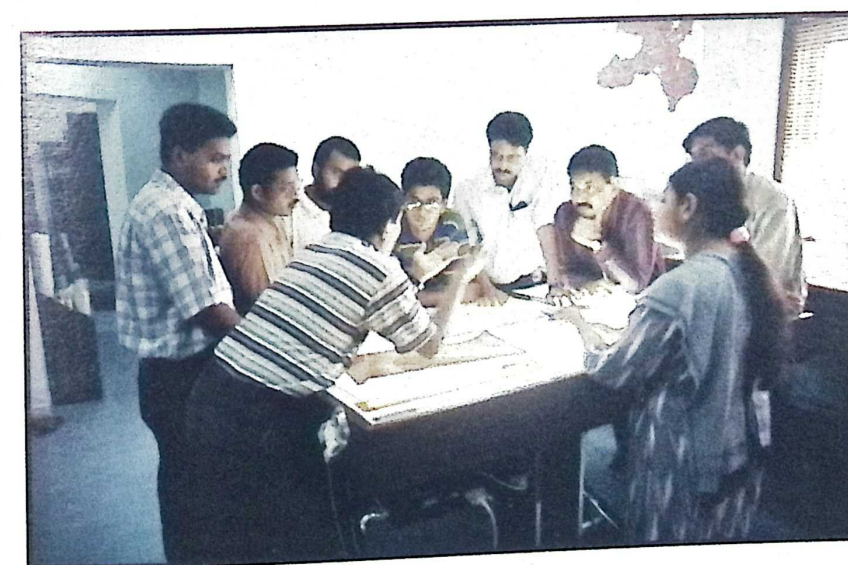
On behalf of the Project Elephant Directorate, Government of India, a three-day workshop on "Action Plan for the Conservation and Management of Elephants in India" was organised at Wildlife Institute of India, Dehra Dun. The workshop was attended by the Chief Wildlife Wardens of various elephant bearing states, members of the Project Elephant Steering Committee, special invitees and some members of the WII faculty.

The workshop discussed problems related to elephant conservation and the suggested actions for their mitigation including the need for research and their priority on a regional basis. Also discussed were issues and problems of captive elephant management, regulations for privately owned elephants and the management of feral elephants in Andaman & Nicobar Islands. On the basis of the discussions and deliberations at the workshop, a detailed Action Plan for the conservation of elephants will be formulated in the coming Five Year Plan.

Wildlife Management Curriculum

17-20 June 1996

Since last year, the diploma course in wildlife management at WII has undergone a structural change, and now offers specific subject teaching in a modular format. Under the ongoing UNDP project at WII, a workshop was conducted on "Curriculum Development of the Diploma Course in Wildlife Management" to discuss further changes therein. The workshop was facilitated by Prof. SD Patki and Prof. NC Jain from Teachers Training Institute, Bhopal. This led to the preparation of an action plan for further revision of the curriculum for implementation.



A short course on GIS conducted for forest officers from Madhya Pradesh in progress.

Vinod Verma

GIS and Remote Sensing

12-20 August 1996

A workshop on the "Application of GIS and Remote Sensing in Wildlife Management" was organized specially at the request of Madhya Pradesh Forest Department, and in which seven of their officers participated. The participants were provided hands-on training in visual interpretation and digitization. They were also exposed to DeskTop GIS, habitat characterisation using remote sensing and GIS, HTML procedures and were provided an introduction to the internet.

Annual Research Seminar

17-19 September 1996

A seminar on the research being conducted by WII has become an important annual milestone which helps evaluate completed and current research projects and also provides the budding researchers and biologists an exercise in public presentation of their research.

At the Tenth Annual Research Seminar held at WII's Chandrabani campus, 28 presentations based on 16 ongoing projects and nine completed projects were made. The seminar was conducted over ten sessions. Among the audience were about 50 invitees, including

Chief Wildlife Wardens, members of WII's Society, Governing Body, TRAC and SAP, wildlife scientists and those from other organisations in Dehra Dun, representatives from NGOs and the media.

The presentations were judged by a panel comprising Dr SM Pandya, Dr V Gnanaprakasam, S Debroy, SC Sharma and Valmik Thapar. The following were selected for the award of certificate and books worth Rs 750/- each :-

- Bivash Pandav, JRF - Hatching and emergence of *Lepidochelys Olivacea* and the impact of coastal development on their seaward orientation;
- Karthikeyan Vasudevan, JRF - Methods for studying rainforest amphibian fauna of the Western Ghats of south India;
- Yashveer Bhatnagar, SRF - Habitat utilization by ibex in Pin Valley national park;
- Prachi Mehta, SRF - Selective logging and bird species composition in Melghat tiger reserve, Maharashtra; and
- Aparajita Datta, JRF - Responses of arboreal mammals to selective logging in western Arunachal Pradesh, North-East India.

Identifying and Prioritizing Research Needs in Zoological Parks

October-December 1996

The institute's Zoo Consultancy Project brought to the fore the lack of scientific research in the captive animal and *ex situ* conservation facilities in India. Concerned at such a finding, WII saw for itself a continuing role and involvement in the scientific management of zoological parks, and it was decided to conduct a series of regional level "Consultation Workshops to Identify and Prioritize Research Needs in

Zoological Parks". During the year, five such workshops were held - Hyderabad (South region), 18 October 1996; Chandigarh (North), 26 October 1996; Guwahati (East), 29 October 1996; Ahmedabad (West), 4 December 1996 and Bhubaneswar (Central and Island regions), 21 December 1996. Besides, a workshop session for suggestions was carried out at the annual meeting of the Indian Zoo Directors in New Delhi on 21 November 1996.

In all, over 150 zoo management personnel ranging from zoo directors, veterinarians, university professors and researchers, wildlife managers and biologists, media personnel and officials of the Central Zoo Authority attended the six workshops. Through these workshops WII was able to collect information on a host of resource institutions and individuals who could collaborate and contribute in conducting basic and applied research in zoological parks. These workshops also helped in identifying and prioritizing information dissemination mechanism and networking modalities between funding and research programme implementing agencies and review the mechanism for research in zoos. Now, an additional questionnaire for collecting secondary and more supportive information is being designed, based on which a comprehensive report is to be presented to the TRAC of WII.

Wildlife Management for SAARC Countries

21-25 October 1996

The workshop on "Wildlife Management for SAARC Countries" was due for the last three years during which period it could not be held for various reasons. Even now when it was held it drew poor response and there were only three overseas participants (two from Nepal and one from Sri Lanka) besides two from India. Country papers were presented by the representatives of Nepal and Sri Lanka, while the issues in India were part of the proceedings across several sessions. The workshop



Vinod Verma

People from various enforcement agencies in the country attended WII's workshop to discuss and find solutions to the problems of illegal wildlife trade in India

addressed policies, ecological and management concepts, legal instruments and issues, park-people interface, research and human resource development needs. One session was devoted to areas of international collaborations. The participants felt that the SAARC forum be used more often and a mechanism be evolved to ensure regular exchange of information between the departments concerned within the SAARC countries.

Illegal Wildlife Trade

26-28 November 1996

The illegal trade in wildlife and wildlife related products is next only to that of narcotics in terms of the money involved. More importantly, the rampant poaching of animals such as tiger, rhino, elephant and others, besides large scale illegal collection of plant species poses a grave threat to biodiversity conservation. WII has been providing laboratory support to intelligence and other agencies for identification of wildlife material and products. At the same time, it has also been trying to bring together representatives from various enforcement agencies to discuss and find ways of curbing the illegal wildlife trade in India. Toward this, a workshop was organized last year and a second one this year, on "Control of Illegal Wildlife Trade in India". The workshop this year was attended by 28

officers, including resource persons, from both Government and non-governmental organisations such as the Directorate of Revenue Intelligence, National Institute of Criminology and Forensic Science; Delhi Police; Central Forensic Science Lab, National Academy of Custom Excise and Narcotics; Indo Tibetan Border Police; Central Bureau of Investigation; Botanical Survey of India; Zoological Survey of India; WWF-Traffic India; Project Tiger; Wildlife

Protection Society of India; Ministry of Environment & Forests, Govt. of India; Legal Action for Wildlife and Environment; Indira Gandhi National Forest Academy; Central Zoo Authority; Salim Ali Centre for Ornithology and Natural History and State Forest Officers.

Issues and topics discussed at the workshop were the Indian Wildlife (Protection) Act, 1972; anti-poaching measures in India, the role of CITES in international wildlife trade; contribution of different enforcement agencies; and forensic techniques. WII had prepared special exhibits on identification of wildlife products and parts, especially on tiger claws and bones. The workshop recommended that judiciary be also involved in such a forum and orientation programmes be conducted for customs and CBI probationers.

Strengthening Wildlife Management and Ecodevelopment Planning

29-30 November 1996

The Government of India, through WII, has been operating a project in collaboration with FAO and UNDP titled "Strengthening Wildlife Management and Ecodevelopment Planning Capabilities". As part of this, two courses each have been conducted in Wildlife Management Planning and Ecodevelopment Planning for



Vinod Verma

Among the workshops conducted this year by WII one was on various aspects of Environmental Impact Assessment

field planning officers located in the various protected areas around the country. The joint project, after a one year extension, finally ended on 31 December 1996. A two-day workshop was organised to mark the culmination of the project and conduct an evaluation of the project outputs. Participants at the workshop included evaluation mission members, representatives from the Indian government, UNDP, field planning officers from various project sites and other officials from the various State Forest Departments and NGOs.

Of the twenty sites originally proposed in the project, work is going on at fourteen sites where about 85% of the delivery outputs have been achieved so far. It was resolved that another six months may be needed to achieve hundred percent delivery target.

Environmental Impact Assessment

26-28 December 1996

Environmental Impact Assessment is increasingly being recognised as a valuable tool in environmental management. Yet, its effectiveness is significantly constrained on account of the manifold flexible approaches. A national workshop was organized on "Current Trends and Practices in Environmental Impact Assessment", co-sponsored by the Ministry of

Environment & Forest, Govt. of India, South Eastern Coalfield Ltd., Bharat Petroleum Corporation Ltd, Cement Ambuja, and the Environmental Division of Steel Authority of India Ltd.

The workshop brought together planners, consultants, environmental engineers, scientists, foresters, resource managers, EIA professionals and Government representatives for promoting a common understanding of the role and scope of EIA within the framework of sustainable development.

Biodiversity Conservation

20-22 January 1997

On the adoption of a global convention on biological diversity by over 150 nations of the world, biodiversity conservation has received international importance and recognition. India being one of the mega diversity countries in the world, has a key role to play in this conservation effort. Since majority of the country's floral and faunal diversity is concentrated in protected and forest areas, a "National Workshop on Integrated Forestry Programme to Support Biodiversity Conservation" was organized. PCCFs and CCFs of the various states attended this workshop to share their experiences and ideas on conserving the biodiversity within the ambit of the existing forestry practices.

The workshop covered major themes such as - integration of biodiversity conservation with ecological and economic development in working plans, management of forests in India for biological diversity and forest productivity legal issues and linking establishment of PAs to their conflicting interface with rural habitations. Eminent conservationists, wildlife biologists, policy makers, land managers and other scientists and forest officers joined the workshop as resource persons.

Workshops Attended

- Dr SP Goyal, Scientist-SE (Biology) attended the "13th International Conference on Animal Reproduction" at Sydney, Australia (30 June-4 July 1996).
- Dr SP Goyal attended the International Congress on "Ecological Summit 96" at Copenhagen, Denmark (19-23 August 1996). He presented a paper titled "Grassland Restoration in Semi-arid Areas: An Alternative Strategy to Minimize Conservation Threats to Endangered Indian Wild Ass in Salt Desert Ecosystem, Western India."
- Ajai Saxena, Scientist-SE (Management) attended the "Vth International Conference on Wetlands" at the University of Perth, Australia (22-27 September 1996). There were 22 other wetland scientists from various countries who participated in the conference. Sessions included Wetlands Restoration and Enhancement, Biomonitoring of Wetlands, Wise Use and Ecological Change in Monsoonal Wetlands and Mangrove Ecosystems. These were followed by a post-conference tour of coastal and inland arid wetlands of north west Australia, covering almost 4000 km. It was conducted in the form of a travelling workshop by well known mangrove ecologist Vic Semunick and covered many important coastal wetlands, mangroves and salt lakes.
- ESRI-India, NIIT GIS Ltd conducted an "ESRI/ERDAS User's Conference" at New Delhi (15-16 November 1996). From WII, four persons attended the conference besides, Steve Beckwitt, the FAO consultant for GIS at WII. They presented two papers - Dr VB Mathur, Scientist-SE (Management) on "Wildlife Management Decision Support System of Bandhavgarh National Park" and Steve Beckwitt titled "Tiger Habitat Corridor Analysis".
- Dr Ravi Chellam attended the Dr Salim Ali Centenary Meeting on the "Biodiversity of the Western Ghats", held at the Indian Institute of Science, Bangalore in November 1996. At the meeting he made a presentation based on the work that is being done as part of WII's "Impact of fragmentation on the biological diversity of rainforest small mammals and herpetofauna of the Western Ghats mountains, south India" project currently under progress.(see section on "Research")
- Indira Gandhi National Forestry Academy, Dehra Dun and Centre for Environment Law, New Delhi organized a workshop on "New Draft Forest Bill and Other Related Subjects" at New Forest, Dehra Dun (14-15 February 1997). From WII, AK Bhardwaj, Scientist-SD (Ecodevelopment) attended the workshop. Participants discussed the shortcomings in existing forest laws, the draft forest bill, Panchayati Raj and forest laws, international conventions and forest laws, and enforcement of existing laws. The recommendations of this workshop are proposed to be sent to the Ministry of Environment and Forests, Govt. of India.
- A workshop on "Capacities Building for Taxonomic Research and Training in India" was organised by the Ministry of Environment and Forests at Jaipur (15-16 February 1997). Shri SK Mukherjee chaired the subgroup on networking of scientific institutions.
- A symposium "Tiger 2000" was organized by the Zoological Society of London, at London (20-21 February 1997). Dr RS Chundawat, Scientist-SD (Biology) attended the symposium where he also presented a paper titled "Tigers in Panna: Prospects for Conservation in Semi Arid, Sub-optimal Habitats".
- Bitapi C Sinha, Scientist-SD (Extension) attended the "National Conference on Management of Tourism in National Parks

and Sanctuaries - The Human Experience" organised by the School of International Studies, Jawaharlal Nehru University, New Delhi (26-27 March 1997).

- The University of Columbia organized a "Forum for Environmental Leaders" to discuss new challenges in biodiversity conservation and how scientists can contribute towards total and quality management. SK Mukherjee, Director WII, was one of the four participants from Asia at the forum.
- SK Mukherjee, Director, attended the XIX Meeting of Indian Board of Wild Life, New Delhi (13 March 1997).

COURSES, TRAINING AND STUDY TOURS

VB Mathur and others (Computer Cell) June 1996

Dr VB Mathur, Faculty incharge Computer/ GIS Cell and four computer personnel were given fellowships under the World Bank ERMN grant for a four-week training programme in California, USA to enhance their skill in the development and management of computerized databases. The staff visited various universities and institutions where they studied various GIS based projects like 'CARA' (California River Assessment) and database on 'FLORA' and 'FAUNA' of California State; USFWS's Gap Analysis Program, the Map and Imagery Laboratory (MIL) and the Alexandria Digital Library (ADL), National Centre for Geographic Information and Analysis (NCGIA).

They also learnt about the usefulness of museum data in conservation, monitoring and management; Natural Diversity Database (NDDDB) which was established in 1979 to conserve California's biological diversity;

different works on spatial databases and Web sites; ESRI Conservation Program (ECP) and ESRI Conservation Data Manager (CDM) program. Training on 'Introduction to Arcview' and 'Programming in Avenue' language was also organized.

Ravi Chellam (Biology) 25 July-15 August 1996

Sponsored by the Cat Specialist Group IUCN/ SSC and the Zoological Society of London, Dr Ravi Chellam visited South Africa and Tanzania. The objective of the visit to sites where large cats had been translocated was to acquaint him with the methods and techniques used in translocating large cats and subsequent monitoring of the released animals. The visit also enabled him to meet and discuss with managers and researchers working on translocation and other researchers working on large carnivores. At WII, Chellam has been involved in the project seeking to translocate some of the lions from Gir (Gujarat), their only sanctuary, to Kuno Palpur wildlife sanctuary in Madhya Pradesh. This visit allowed him a fresh insight into the problems in translocating large cats and the ways to anticipate and manage these.

In South Africa, Chellam visited Pilansberg national park and Phinda resource reserve where lions and cheetahs have been translocated for purposes of ecotourism, and The Mammal Research Institute at the University of Pretoria which was involved in the monitoring of the translocation programme and the Kruger national park for work on radio collared African wild dogs. In Tanzania, Chellam visited Serengeti national park to interact with researchers working with lions, cheetahs and spotted hyenas. Chellam made a presentation based on this visit to South Africa and Tanzania at a meeting on the Cat Specialist Group held in New Delhi in December 1996.

BMS Rathore (Ecodevelopment) 22 July-13 September 1996

Under a UNDP fellowship BMS Rathore visited the University of Wolverhampton, Forestry Commission, Edinburgh and the Newton Rigg College in Forestry to understand the framework of 'competence based training in UK' and how such training could be useful in curriculum design at WII. He also attended a course in Management Skills for Rural Development at the University of Reading.

Bitapi C Sinha (Extension) 1 December - 19 January 1997

Bitapi Sinha was in the UK on a fellowship to study and understand the various aspects of conservation education. She visited Marwell Zoological Park, Drusillas Nature Park, Jersey Wildlife Preservation Trust, Bristol Zoological Garden, Slimbridge Wetland and Wildfowl Trust, Paington Zoo, Dartmore National Park, Edinburgh Zoo, Chester Zoo and London Zoo. The institutions with which Bitapi worked allowed her to understand the role of modern zoos in conservation education. Besides attending classroom sessions and participating in discussions, she also had an opportunity of doing hands-on-exercises and interacting with school groups.

Laboratory training 23-27 December 1996

CP Sharma, Laboratory Technician, attended a training programme in 'Analytical Techniques' conducted by the Wadia Institute of Himalayan Geology, Dehra Dun. The training (23 - 27 Dec.) included lectures and practical in sophisticated analytical instruments like X - Ray Fluorescence Spectrometry, Inductively Coupled Plasma, Atomic Emission Spectrometry, X- Ray Diffractometry, Ion Chromatography and Scanning Electron Microscopy.

DVS Khati (Extension) 4 February-4 May 1997

DVS Khati was awarded a fellowship by the Overseas Development Administration (UK) to attend a course in "Planning of Projects for Biodiversity Conservation" at the Bradford University, UK. The aim of the course was to provide the participants with an understanding of both issues and techniques relevant to the planning of projects for biodiversity conservation.

At the course, Khati was exposed to concepts in - logical framework (Logframe) and its use in project planning; communities and conservation; discounting and measures of project worth; valuation of biodiversity and environmental effect; economic evaluation of protected areas; and benefit cost analysis of projects. Field visits were undertaken to wetlands, national parks and nature reserves, and various organizations and institutions involved in the conservation of Biodiversity in UK.

UNDP fellowships

As part of the faculty improvement programme, five members of WII faculty availed UNDP fellowships to visit three different countries i.e. Tanzania, Australia and UK. Besides, three faculty members undertook study tours to Australia, New Zealand, Malaysia and Indonesia under the project.

RESEARCH

WII conducts research on the ecological, biological, socio-economic and managerial aspects of wildlife conservation in various parts of the country. The research projects generate valuable scientific data, help evolve study techniques relevant to the Indian ground conditions, and also create a group of trained field biologists, socio-economists and wildlife managers. The scientific information generated not only proves useful in the management of protected areas, but also helps the institute faculty to keep abreast of the current field situation, management needs and research trends, thereby constantly updating its teaching inputs and refreshing its professional capabilities.

WII has a Training Research and Academic Council (TRAC) to approve the study project proposals and ensure that these conform to the national conservation priorities. TRAC is a 23-member committee which was set up on 22 July 1996 and took over from erstwhile Research Advisory Committee.

WII's research projects located at the various sites around the country are conducted in collaboration with the respective state forest departments, namely the state forest departments of Uttar Pradesh, Madhya Pradesh, Rajasthan, Orissa, Himachal Pradesh, Maharashtra, Bihar, Arunachal Pradesh, Tamil Nadu, Gujarat and West Bengal. Besides, WII also collaborates with sister institutions such as Salim Ali Centre for Ornithology and Natural History (SACON), Coimbatore; Indian Institute of Remote Sensing, Dehra Dun; Regional Remote Sensing Service Centre, Kharagpur; Department of Ocean Development (Govt. of India), Goa; National Institute of Immunology, New Delhi; National Zoological Park, New Delhi; and Wadia Institute of Himalayan Geology, Dehra Dun, among others.

The following is the description of the various research projects, completed or in progress during the period under reporting.

ON GOING PROJECTS

Developing a long-term monitoring programme for birds and mammals of the Indian Ocean and Antarctica using GIS and GPS technologies

Faculty: Dr S Sathyakumar, Dr SA Hussain and Ajai Saxena

India has long been a part of international efforts to study Antarctica's unique ecosystem and biodiversity. In fact, India is a signatory to the Protocol on the Antarctica Treaty which makes it mandatory, through Article 5 of the Conservation of Antarctica Fauna and Flora, and Article 5 of the Environmental Impact Assessment, for it to have permanent station there for the collection of baseline information on flora and fauna, and for monitoring key environmental indicators to assess, verify and minimise or mitigate the impact of any activity on the region's ecosystem.

In 1981, the Government of India started taking scientific expeditions to Antarctica, and two permanent research stations were established - "Dakhsin Gangotri" on the ice shelf, eight nautical miles away from the Princess Astrid Coast, and the "Maitri" at the Schirmacher Oasis.

WII has been part of the Indian expedition for the last two years, entrusted by the Department of Ocean Development, Government of India, to develop a monitoring protocol for the major fauna of the region. This year, in the XVI Scientific Expedition to Antarctica (5 December 1996-7 April 1997) WII was represented by two members of its faculty. In Antarctica, Hussain and Saxena made nine aerial sorties totalling 20 hour to census the seals and penguins along the Princess Astrid Coast between 100 and 130 East latitude. During the census a map of the coastline was developed with the help of the Naval Hydrographic Team. This map will help in identifying areas important to wildlife. Apart from these, extensive surveys around the

Schirmacher oasis and Filchener Mountain of the Orvin mountain range was carried out to assess the population structure, nesting success and behaviour of terrestrial birds.

En route to Antarctica, monitoring of birds and aquatic mammals of Indian ocean was carried out from the ship. Daily, six hours of monitoring was carried out - three hours each in the morning and evening. The monitoring period was extended to twelve hours when the ship entered 600 South latitude. Monitoring of wildlife was repeated during the return journey. This monitoring programme yielded interesting information on the distribution pattern of pelagic birds of the Indian ocean region.

The data collected during the expedition is under analysis and the monitoring protocol is being finalised. Encouraged with the tasks conducted, WII proposes to have a permanent unit to carry out Antarctic research.

Strengthening the National Wildlife Database

*Faculty : Dr VB Mathur
Assistant : JS Kathayat*

The objectives of the computer-based National Wildlife Database are to (1) 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; (2) establish linkages with researchers, protected area managers and planners and other such data centres; (3) facilitate research and training activities in wildlife by providing bibliographic support.

In 1996-97, the main thrust has been on data collection, input and its validation. Assistance was also provided in the development of an Atlas on Indian Protected Areas by supplying coordinates and district/s locations.

The Protected Area Database was updated further. At present, there are 532 protected areas in India - 85 national parks and 447 wildlife sanctuaries, covering 145,325 km² which is 4.41% of the country's total geographical area.

During the year, over 350 user queries were attended to and outputs provided. The bibliographic database was updated and cross-checked from various published and unpublished sources. It was also converted from Database to Textual formats to make it more user-friendly. Technical reports and bibliographic summaries were also prepared on various aspects of the database.

With the completion of the second phase of the project, its final report was submitted in May 1996.

Survey of animal damage problem in and around protected areas and managed forests in India : Phase-II

*Faculty : Dr NPS Chauhan
Researcher: Dr KS Rajpurohit*

In India, most of the protected areas are fragmented and disturbed from human activities, cattle grazing and exploitation of resources. Due to encroachment on forest lands and loss of habitats and habitat quality, there has been a drastic reduction of wildlife in the country. This has also resulted in ecological dislocation of many species from their former ranges. The disoriented animals stray into human habitations which is resulting in increasing conflicts and destruction of life and property. Cases of human killings, cattle lifting and crop raiding by wild animals are being reported from every state. However, the extent of the problem is still vaguely defined and understood, and only scattered information is available. This project aims to collect factual information on the nature and extent of damage, paradigm of conflicts with people in different states and suggest strategies to minimize the problems.

In Phase I of the project, the problem areas in the states of Bihar, Orissa and Madhya Pradesh were looked into. Last year, as part of the Phase II, the focus was on the states of Rajasthan, Uttar Pradesh and Himachal Pradesh; and the Rajasthan sector had been completed. This year, the attention was turned on Uttar Pradesh and Himachal Pradesh.

In the plains of Uttar Pradesh, crop damage by nilgai is common. Crop damage by elephant and wild boar was observed along the peripheries of Rajaji, Dudhwa and Corbett national parks. In the hills of Uttar Pradesh, there are pockets in which crops are damaged by black bear and wild boar. Apart from this, cattlelifting and sheep and goat killing by leopard is also a problem throughout the hills. Human casualties by leopards were reported from Nainital, Pithoragarh, Pauri Garhwal, Almora west, Almora east, Kedarnath and Badrinath forest divisions.

In Himachal Pradesh, human-wildlife conflict is on the increase; human casualties by leopards is a serious problem. Affected areas are Shimla, Theog, Bilaspur, Hamirpur, Jogindernagar, Dharamshala, Palampur, Nampur and Chamba forest divisions. Crop damage by monkeys is also considerable, which requires immediate attention.

Survey of Siberian and common cranes in their wintering range in India

Faculty : BC Choudhury

Researchers : Divya Mudappa, Jatinder Kaur, Ratin Burman, Amar Singh Panwar and Rashid M Raza

Over the past few years, there has been a rapid decrease in the arrival of wintering Siberian cranes in India. Concerned at this, in 1994, the Indian government, along with International Crane Foundation attempted a restocking plan but it did not work as no Siberian cranes wintered that year. The next year, it was agreed to initiate a study on the ecology and migration

of common cranes instead of the Siberian cranes. Both these cranes have somewhat overlapping migratory flyway over Afghanistan and Pakistan, and the migration in cranes is considered to be acquired through a learning process. It was thought to bring Siberian cranes bred in Germany and the USA to the Keoladeo Ghana national park in Bharatpur (Rajasthan) before the arrival of the common cranes, and the latter would then act as "carriers" to the introduced cranes on their return migration. It was also decided to carry out surveys all along the historical wintering range of the Siberian cranes in India in order to locate other wintering sites, if any.

The project commenced last year, in July 1995. During the nine-month survey, the researchers visited the Gangetic flood plains in Gujarat, Rajasthan, Uttar Pradesh, Madhya Pradesh, Bihar and West Bengal, besides the Brahmaputra flood plains in Assam and Arunachal Pradesh to assess the population and habitat status of the migratory Common crane, Demoiselle crane and Siberian crane. An additional benefit was the assessment of the status of the resident Sarus crane populations and their habitats. The findings of the survey were presented at the Siberian Crane Range Country meeting at Keoladeo Ghana national park in November 1996. The meeting was jointly organized by the Govt of India, Convention of Migratory Species and the International Crane Foundation. The major findings included - drastic decline of the wetland habitats in the Gangetic flood plains, changes in landuse patterns and their impact on the crane habitats and populations, and the reporting of migratory cranes in some new habitats. The survey and the meeting stressed the urgent need for conducting species oriented research, confirmation of migratory pathways and a coordinated status survey of cranes in India, besides developing an awareness programme on the subject.

Developing area specific management guidelines for conservation of biodiversity in Satpura Conservation Area, taking into account the forestry objectives and local people's needs.

Faculty : VB Sawarkar, Dr PK Mathur

Researchers : Prachi Mehta, Azra Musavi

Active scientific management for the conservation of wildlife in managed forests, though a relatively new concept in India, is already seen as vital to the future planning of the PA network in the country. This project seeks to develop these wildlife management concepts in the Indian context and evolve guidelines which would not only conserve biodiversity but also cater to the people's balanced immediate and future needs.

The field work, conducted in Melghat tiger reserve (Maharashtra), completed in July 1996. Mehta's work related to the response of selected groups of bird species to silvicultural treatments of forest stands both, natural and plantations, which inter alia represented a gradation of successional stages. Musavi, on the other hand, addressed the relationship of the forest based economy of the local people and its pressures and impacts on the forest resources. Her work was supplemented by a wider structured query through line officials of the forest department. An evaluation of the people-benefit programmes developed and delivered by other agencies was integral in this work. Both researchers are currently engaged in analysing their field data and developing various sections of their research report.

Establishing computerized wildlife database for conservation monitoring and evaluation in Tadoba-Andhari tiger reserve

Faculty : Dr VB Mathur

Researcher : Yogesh K Dubey

Protected areas lack precise or accurate and standardized methodologies for collecting data

or even conducting routine surveys for monitoring vegetational and animal distributional changes. This affects proper conservation. It is being felt that the management planning capabilities of the managers need to be enhanced for the success of their management plans, by developing simple, rapid, field friendly and computer compatible methods for data collection, collation and analyses. It was with this idea that the current project was started in 1994 to develop computerized database on spatial as well as non-spatial attributes using ecological, managerial and socio-economic data.

In the current year data was collected on habitat use using indirect method of pellet group count. Data was also collected from 100x4 m long strip transects. Road counts were done to assess the abundance of herbivore population. Unique habitats were monitored periodically to generate index of use of these habitat by various species. Scat samples of tiger and sloth bear were collected to determine their food habits. Biomass study was carried out in the anthropogenic grasslands which play a pivotal role in providing forage to species like chital, gaur and wild boar. Data was also collected on the use of these grassland by different herbivore species using direct and indirect methods.

Keeping in view the project objective of motivation and training of field staff, field exercises were conducted for forest guards. A workshop on pugmark census and waterhole counts was conducted for field staff during which intensive training was given on field techniques. Field staff was also involved in monitoring.

The field work will end by June 1997 and the report of the study is expected to be ready by December 1997.

Ecology of tiger: To enable a realistic projection of the requirements needed to maintain a viable population of tigers in India

Faculty : Dr RS Chundawat
Researcher : Neel Gogate

After the success in tiger conservation in the seventies and eighties, the tiger population is again on a down-slide in the last few years, which necessitates looking into the problem afresh. This project, by studying the tiger's feeding ecology, habitat utilization, home ranges and movement patterns, intends to make a realistic projection of the requirements needed (both, prey and minimum protected area) to maintain a demographically viable population of tigers. This would help in not only predicting the potential of India's PA network for conserving tigers and their habitats, but also to target special programmes for managing crucial tiger habitats and large carnivore population.

The field work, located in Panna national park, started in December 1995 and after preliminary spadework, six tigers had been identified for radio-collaring. In April 1996, two tigers (one adult male and one sub-adult female) were radio-collared. These were located on kills and immobilized using the drug Medetomidine in combination with Ketamine hydrochloride. A

proportion of 0.05 mg Medetomidine and 3.5 mg of Ketamine hydrochloride per kg body weight was used to achieve desirable sedation. Both animals were revived by using specific antagonist, Atipamezole.

The radio-collared animals were then tracked systematically to collect information on their movement pattern and home range. Home ranges were calculated by the minimum convex polygon method. The summer home ranges of the male was 115 sq km and that of the female 31 sq km. The sub-adult female's home range achieved an asymptote after 14 locations, whereas adult male's home range stabilized after 20 locations. About 80% of the locations of the male was within an area of 42.5 sq km and that of the female in 3.8 sq km. The mean distance travelled in 24 hrs between two locations by the male tiger was 3.88 ± 0.54 km, whereas the mean distance travelled by the female was 2.26 ± 0.52 km.

The dispersing sub-adult female suddenly died in September 1996 and the cause of her mortality could not be ascertained. During the monsoon and subsequent months, the male tiger enlarged its home range substantially to 172 sq km, which now extends outside the park. In January 1997, one more adult female with three cubs was radio-collared within the male's territory. Preliminary analysis suggests that she is active over 35-40 sq km of area.



Abi Tamin

A tiger being radio-collared, as part of WII's research study at Panna National Park, Madhya Pradesh

Ecology of gaur (*Bos gaurus*) in Pench tiger reserve, Madhya Pradesh

Faculty : Dr K Sankar and Qamar Qureshi
Researchers : Mohd Khaleed Syed Pasha and G Areendran

The study aims to collect information on the distribution, density, group size and composition, diet, home range and habitat use of gaur and accordingly make recommendations for better management in the Pench tiger reserve.

In the initial reconnaissance phase, methodologies for vegetation quantification, biomass studies, leaf and fruit fall quantification, ungulate population monitoring, home range and habitat use of gaur and plant phenology studies were tested in field. Important trees, shrubs and grasses have been permanently marked for phenology monitoring. Six line transects and three vehicle transects are being monitored in Pench national park.

These transects have been walked/monitored in different seasons. Based on the density information on gaur, chital, sambar and nilgai has been calculated for the summer and winter. Data on group size, age and sex ratio, female-young ratio and habitat use of wild ungulates have been collected. Data on food habits of gaur was presented at the Annual Research Seminar in September 1996. It is now planned to capture 10 gaurs for radio-collaring and the collecting blood and tissue samples in April-May 1997.

Nanda Devi Biosphere Reserve : A study on socio-economic aspects for the sustainable development of resource dependent population, Uttar Pradesh

Faculty : Ruchi Badola
Researcher : Chandra Shekhar Silori

The Nanda Devi region in Chamoli Garhwal (UP) was declared a biosphere reserve in 1988.



Khaleed S. Pasha

"Chlogophytum tuberosum" found in Pench National Park, is a medicinal plant used by tribals in Central India

There are 15 villages located in the buffer zone of the reserve. This study seeks to quantify the dependency of the people in these villages and therein the biotic pressure on the natural resources of the reserve. Also, the socio-economic and cultural status of the villagers will be looked into and strategies suggested for sustainable utilization of natural resources in the reserve's buffer zone.

The period under reporting was the third and final year of field work. During this, the part of the biosphere reserve falling in the Kumaon region was surveyed for assessing the (i) socio-economic aspects of the villagers, and (ii) the dependency and quantification of biotic pressure there. There are a total of seven villages here of which five are located in district Pithoragarh and two in district Almora. The villages here are located far from the roadhead, ranging from 20 km to 70 km.

In the Garhwal part of the reserve, the studies on the impact of sheep and goats grazing on the herbaceous layer and per capita biomass consumption pattern in the three sampled villages were continued. Subsequently, data on the attitude of local villagers towards the options of introducing techniques of sustainable utilization of natural resources was collected from Reni and Lata villages in district Chamoli.

Information was gathered through a questionnaire survey, and to quantify biotic pressure, transects were laid around all the villages. The entry points were monitored regularly to quantify the biomass extraction from the buffer zone and adjoining reserve forests. The trails used by the villagers for the collection of biomass resources were used as transect, and circular plots of 10 mts radius were laid on either side of these transects at fixed intervals of 200 mts. The incoming headloads of biomass were weighed randomly at various points on the village boundary to quantify the extraction of biomass in the form of firewood, grass and non-timber forest produces. Other parameters recorded were number of total trees, number of cut trees, number of lopped trees, number of regeneration and recruitment for each tree species, sign of cattle grazing, number of dung piles, percent area under grass cover and proportion of weed and non-weed species. Besides these, the signs of habitat use by wild animals were also recorded in relation to the biotic pressure and distance from the village.

While the data collected from the Kumaon side is yet to be analyzed, it was clear that almost 100% human and livestock population of all the seven villages are dependent for their sustenance on the buffer zone. These dependency period ranges from a minimum six months to 12 months in a year. While all the five villages in the district Pithoragarh in buffer zone are migratory, the two villages of district Almora are permanent and thus use the resources of the biosphere reserve throughout the year. Also, unlike in district Chamoli, where

sheep and goat stay a very short period (1-2 weeks) inside the buffer zone during migration, in Pithoragarh and Almora parts, annually about 12,000 sheep and goats graze in the alpine meadows for 4-5 months of a year from May to October.

Annual progress reports have been submitted to the Ministry of Environment and Forests, and the preparation of final report is underway.

Ecological study of montane grasslands in the Valley of Flowers (VOF) and Eravikulam national parks (ENP)

Faculty : Dr GS Rawat

Researchers : CP Kala & PV Karunakaran

The temperate and tropical grasslands of India located in the mid-ranges of the Himalaya and the Western Ghats occur in different biogeographic zones, have a high level of endemism, yet also have similarities in flora and fauna. This and their high human use value necessitate their closer evaluation and conservation. But lack of adequate scientific data on these grasslands prevents effective conservation planning.

This project was started in 1992 at two representative sites - Valley of Flowers national park (Western Himalaya, UP) and Eravikulam national park, Kerala (Western Ghats, Kerala). The objectives of the study were to - (i) prepare the floristic inventory of the grasslands/meadows, (ii) to study the community structure, composition, biomass productivity and successional trends, (iii) to study the animal use patterns and their impact on vegetation, and (iv) to study the management problems and evolve comprehensive conservation plans for the respective areas. The field work at both sites completed last year. During the reporting period all the data on the vegetation and environmental parameters for both the areas were analyzed. The study is now complete and all project objectives have been achieved. Two papers on the ecological and



G.S. Rawat



G.S. Rawat

WII's study on montane grassland covers two different and distant areas like the Valley of Flowers (inset above) in Western Himalaya and Shola Grasslands of Eravikulam in the Kerala Western Ghata.

conservation aspects of the study areas have been presented at national seminars. The final report of the project is likely to be published soon.

Release of captive Himalayan Musk deer in Kedarnath wildlife sanctuary, Uttar Pradesh

Faculty : Dr S Sathiyakumar and Dr PK Malik
Researcher : S Saunand

Once distributed all along the southern side of the Himalaya over 2500 mts up to the treeline, musk deer today is found in depleted numbers in isolated pockets only. Destruction of its habitat and poaching for its musk have been the main causes for this state of decline. A captive breeding centre was set up by the state forest department at Kanchulakhark in the Kedarnath wildlife sanctuary to help reverse this decline. This study project, started in 1994, was to study the captive musk deer at the centre and ultimately reintroduce a few individuals in an area where the species had become locally extinct in the recent past.

During the year under reporting, health histopathological and parasitological investigations on the captive musk deer at the Breeding Centre were carried out. Results showed that all captive musk deer are infected with lungworm (*Dictyocaulous spp.*) and are therefore not suitable for release into the wild. It was also decided that with a very low captive stock at the Breeding Centre, the time is not suitable for a sustainable release programme. As such it was considered not to proceed further with the project. Meanwhile analysis of data gathered and work on writing the final report are in progress.

Conservation status of otters and associated wetland fauna in the lower Himalaya and in Terai, Uttar Pradesh

Faculty : Dr SA Hussain

Three species of otters occur in the Indian subcontinent, viz. the Eurasian otter *Lutra lutra*, the smooth-coated otter *Lutra perspicillata* and the oriental small-clawed otter *Aonyx cinerea*. The smooth-coated otter is distributed

throughout the country from the Himalaya southward, but the other two are restricted to the Himalaya, north of the river Ganga and to southern India, and are considered to be absent from central India. However, the existing populations of the three Indian species of otters and their habitat have never been systematically surveyed. It is believed that these populations are under serious decline due to intensive trapping, loss of habitat and pollution.

This short-term ecological survey was carried to (1) determine the status and distribution of otters and other aquatic fauna in the Terai and lower Himalaya; (2) identify the threats to their population in this region; (3) assess the levels of interspecific competition with other aquatic fauna and anthropogenic pressure on otter population; and (4) provide recommendations for improved conservation management of the otters in this region. The survey was conducted in and around Corbett and Dudhwa national parks, Katerniaghat wildlife sanctuary and the Alaknanda valley along the Alaknanda river. Seventyfour sites were examined for signs of otter presence, of which 47 sites were inside protected areas and 27 in adjacent areas. Sites were classified into four categories - upland rivers (20 sites), lowland rivers (21), swamps and marshes (24), and lakes and reservoirs (9). Inside the PAs, 32 sites (68%) showed signs of

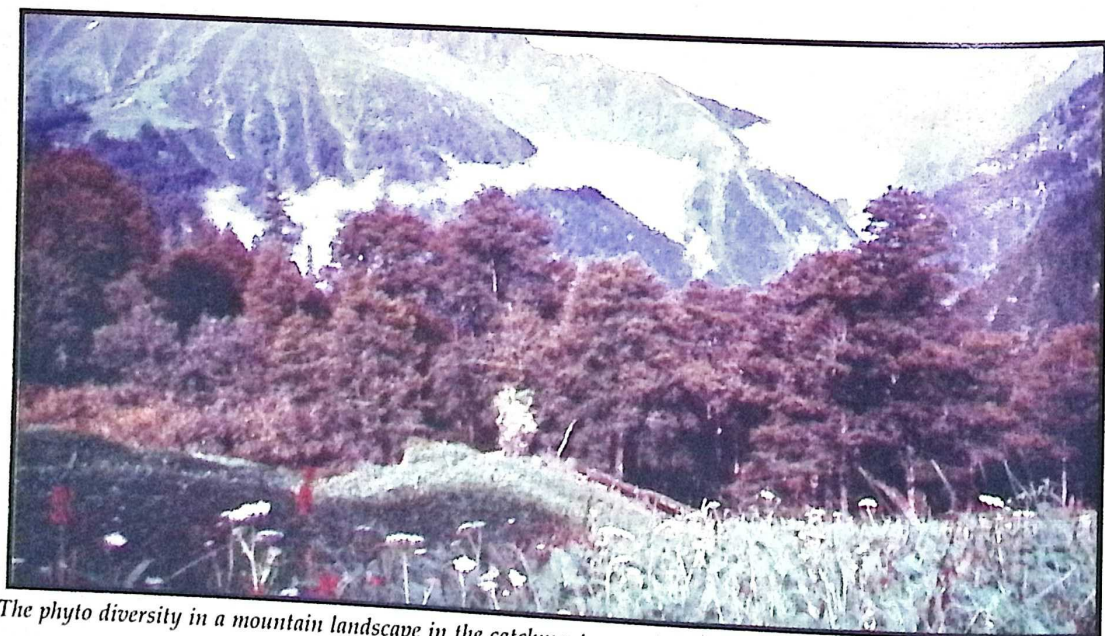
otter presence, whereas outside the PAs such signs were found at only 2 sites (7%). Of the sites, otter signs were found in swamps and marshes (67%), lowland rivers (52%), upland rivers (30%), and reservoirs and lakes (11%). The presence of otter signs positively correlated with bankside vegetation ($p < 0.05$) indicating the importance of shoreline vegetation for otters. Within the PAs, otter habitats were unmanaged, while outside, these were subjected to severe anthropogenic pressures.

It is recommended that wetland hydrology and prey availability be regularly monitored, and grazing pressure and aquatic weeds in wetlands within the PAs be reduced. The boundaries of the PAs also need to be realigned to include otter habitats adjacent to the PAs. The detailed report of the project is under preparation.

Conservation status of high altitude forests in Garhwal Himalaya

Faculty : Dr GS Rawat and Dr Asha Rajvanshi
Researchers : Dr BS Adhikari, Anjali Awasthi and Sanjay Uniyal

The project was initiated last year with the objectives to (i) conduct the status survey of rare, endangered and endemic plants in the Bhagirathi catchment; (ii) study the structure



The phyto diversity in a mountain landscape in the catchment area of the river Bhagirathi, Western Himalaya.

Sanjay K. Singh



Bitapi C. Sinha

Tourist arrival at Bijrani, a day visitor zone in the Corbett Tiger Reserve, where elephant ride facilities are also available

and composition of forests along the altitudinal and human use gradients; (iii) study the landuse practices and biotic pressures in the study area; and (iv) compare the status of wildlife and forests in the disturbed and undisturbed valleys of the study area for better landuse and conservation planning.

During 1996-97, detailed vegetation and socio-economic surveys of the Bhagirathi and Bhilangana valleys, in and around the Tehri Dam submergence area, were conducted. The field work in the intensive study area (upstream of Bhagirathi valley) is in progress. An interim report is under review.

Impact assessment of tourism in Corbett national park, Uttar Pradesh

Faculty : Bitapi C Sinha, Dr BK Mishra and UK Bhattacharya

Researcher : Manisha Thapliyal

The idea for this study came from a two-day workshop on "Research and Monitoring Needs of Corbett Tiger Reserve". At the workshop, it was felt necessary to have a project wherein information on the current status of tourism in the tiger reserve could be gathered, the impacts of tourism on habitat and wildlife could be identified and quantified and accordingly

management recommendations could be made for planning a tourism which would be sustainable and compatible with conservation.

Last year, a month-long reconnaissance was conducted. It was found that last year, 31,515 people had come to Corbett as Day visitors. 10% of these were foreigners. Visitors to Corbett can be classified into three groups - individuals with family and friends, package tours by tour operators, and package tours by resort owners. A questionnaire was also developed and administered to 110 visitors at Bijrani. Wildlife viewing from vehicle or elephant and tiger sighting were rated as the two most important objectives of the visitors for coming to Corbett, followed by Wildlife photography.

Based on the analysis of the data obtained, the questionnaire was modified and fieldwork resumed from mid-November 1996.

Behavioural ecology of caracal in Sariska tiger reserve, Rajasthan

Faculty : Dr AJT Johnsingh and Dr SP Goyal
Researcher : Shomita Mukherjee

India has the highest diversity of cats in the world but it is largely the larger ones which



Shomita Mukherjee

Sherman's live-trap used for catching rodents in the dense scrub forest of Sariska Tiger Reserve

have been somewhat studied. The smaller cats, though endangered, have received scant attention. This study seeks to collect information on the habitat use and feeding ecology of small carnivores - the caracal and its co-predators, jungle cat and jackal in Sariska tiger reserve.

Field work was completed in May 1996. Currently, the field data is being analyzed and scats collected ($n > 1000$) through random searches, on transects and along roads and trails in various habitat types are being given a closer look in the laboratory. Mandibles found in scats were compared to standards for identifying rodent species.

So far, 198 scats of all the three predators collected from various habitats: open scrub ($n=126$: summer $n=49$, winter $n=77$), dense scrub ($n=54$: summer $n=45$, winter $n=9$), and hill forests ($n=18$), were weighed, their diameters measured and remains of prey analyzed. Cumulative percent occurrence of major prey for the open scrub shows that a minimum of 60-70 scats are needed for winter and 35-45 scats for summer to obtain reliable prey estimates in the small predator's diet.

From the scat samples collected it has been observed that small mammals constitute the major portion (95%) of the diet of these

predators. Rodents are the major mammalian prey and occur in 82% of scats. Three rodent species identified in scats are *Tatera indica*, *Golunda elioti* and *Mus platythrix*. Other important prey found in scats are birds (29%), insects (21%) and reptiles (20%).

It has also been found that during summer 93% scats from the dense scrub contain rodents, with *T. indica* (43%), while overall more rodents are taken in winter (90%) than in summer (69%) when the predators switch over to mainly birds and insects. Reptiles (32%) are consumed in significantly higher numbers in the dense scrub than in open scrub (26% and 14% respectively). In open scrub, the summer diet (Simpson's diversity index $1/D = 7.4294$) is more diverse than the winter diet ($1/D = 6.7613$).

Overall, the hill forest diet is the most diverse ($1/D = 8.2304$). In hill forest scats, rodents occur in 77% of the samples but the percentage of scats containing other items such as insects (44.4%), reptiles (38.89%) and birds (33.3%) is higher than found in scats from open and dense scrubs.

The technique for identifying scats using thin layer chromatography (TLC) is being standardized so as to compare the food habits of the three carnivores. Work on analysis of various habitat parameters, prey abundance and predator abundance is in progress.

Evaluation of elephant habitat in Singhbhum in relation to fragmentation, degradation, mining and other disturbance factors

Faculty: Dr S Chowdhury and Dr Asha Rajvanshi
Researchers: RK Singh and Prabhat K Bhagat

Once boasting one of the finest sal forests in the country and a prime habitat for the elephants, the Singhbhum forests in the Chotanagpur plateau in south Bihar are fast losing their floral and faunal splendour. This has been largely in the absence of any protected



R.K. Singh

Infrastructures for transport and other mining operations in the Singhbhum forests (Bihar) cause severe pollution and are a threat to the wildlife therein

area status on the one hand and improper landuse and development pattern such as heavy mining, illegal felling and hunting. This study was undertaken to find the effects of habitat fragmentation and mining on the elephant population and habitats.

The findings of research so far reveal that unregulated iron-ore discharges from the mines into the Koina river, once a critical habitat for the elephants particularly during the summer months, has significantly reduced the riverine habitat values and its subsequent avoidance by elephants. The water quality regime improved dramatically when the discharge remained regulated. This underlines the significance of regulating the mine discharges below the permissible limits to restore the eco-system health.

The study also finds the occurrence of elevated levels of four heavy metals viz. Pb, Zn, Mn & Cu to be a major environmental hazard. The study would now seek to estimate the uptake of heavy metals and their distribution in various plants and animal communities.

The study has also collected a lot of data on the different patch sizes of elephant occupancy, utilization and preference structures of habitats. The analysis of this data is in progress.

The TRAC has approved the extension of this project up to December 1997.

Responses of arboreal mammals to selective logging in western Arunachal Pradesh

Faculty: Dr SP Goyal
Researcher: Aparajita Datta

The North-East has a diverse assemblage of arboreal squirrels and primates, whose survival depends on their ability to co-exist in a habitat modified due to timber extraction which creates gaps in the canopy and results in loss of food and nest trees.

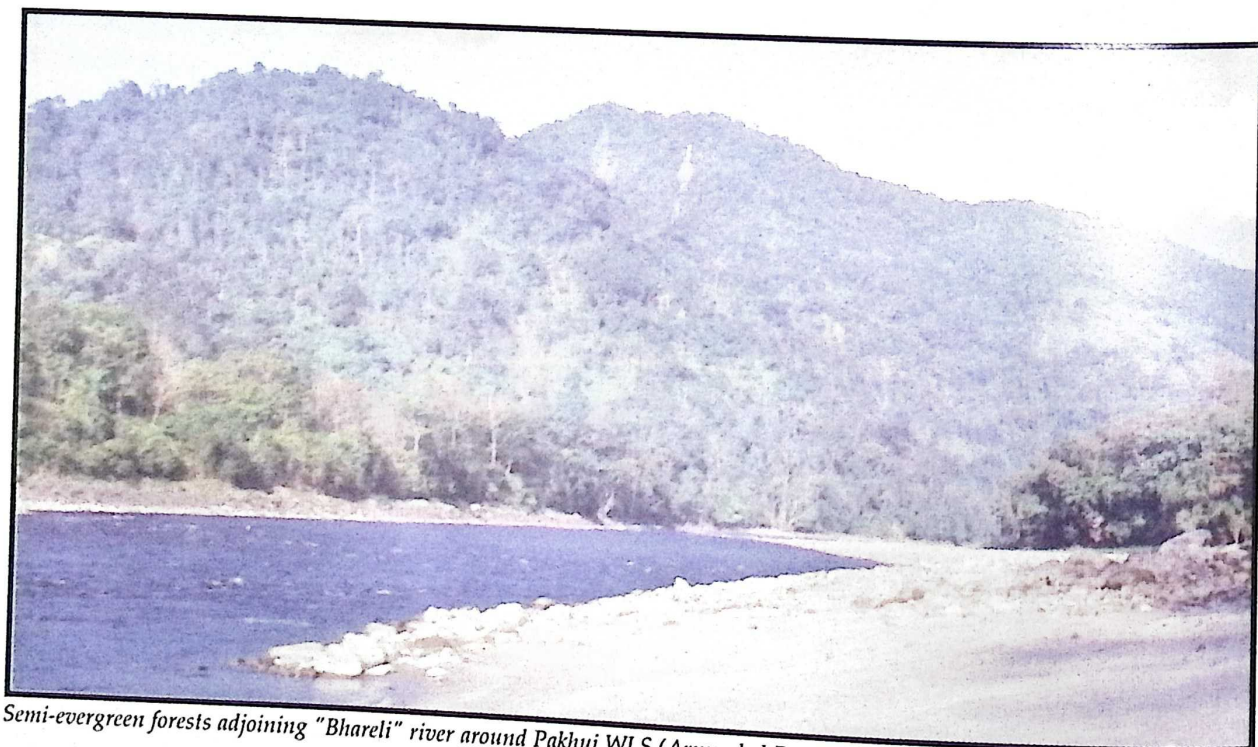
This short-term study sought to determine the responses of squirrel and primate species to selective logging in Pakhui wildlife sanctuary and adjoining reserve forests of Khellong Forest Division in western Arunachal Pradesh. Four squirrel and three primate species were recorded. The relative abundance (encounter rates) of squirrel and primate species was compared across logged forests, a plantation, a 20-25 year old logged forest, semi-disturbed forests and unlogged primary forests. Vegetation structure, species composition and canopy continuity of the different forest strata were quantified in 10 mt radius circular plots along these trails.

Large tree density (GBH > 150 cm), basal area and canopy cover were highest in unlogged forest. As many as 60 species are felled mainly due to the rarity of the most valuable species. Fewer species are taken for timber alone but plywood mills are less selective for both species and girth class. Incidental damage during the felling process is substantial.

Among the four squirrel species recorded, the abundance of Malayan giant squirrel (MGS), red-bellied (RBS) and Himalayan striped squirrel (HSS) was highest in unlogged forests. The abundance of MGS was positively

correlated with tree density, basal area and canopy cover. The abundance of RBS was positively correlated with high tree species diversity and basal area. The abundance of hoary bellied squirrel, a generalist species, was negatively correlated with canopy cover and tree density. The relatively larger sized MGS and the RBS foraged at significantly greater heights than the other two smaller species. The reduced canopy cover, tree density and basal area in logged forests and low species diversity and structural complexity in plantations leads to either reduced numbers or total absence of specialist squirrels. Nests of MGS and RBS were recorded on 28 tree species, of which 20 are used as timber species. Nesting requirements, degree of arboreality and diet plays an important role in squirrel abundance in these forests.

Primate encounter rates were also significantly different across strata. Primate abundance was very low in logged forests (0.27/km) and highest in unlogged primary forests (4.18/km). Capped langur and Assamese macaque, which are highly arboreal and habitat specialists, had the highest abundance in unlogged forest (3.22/km and 0.84/km respectively).



Semi-evergreen forests adjoining "Bhareli" river around Pakhui WLS (Arunachal Pradesh), one of WII's research project site.

S.P. Goyal

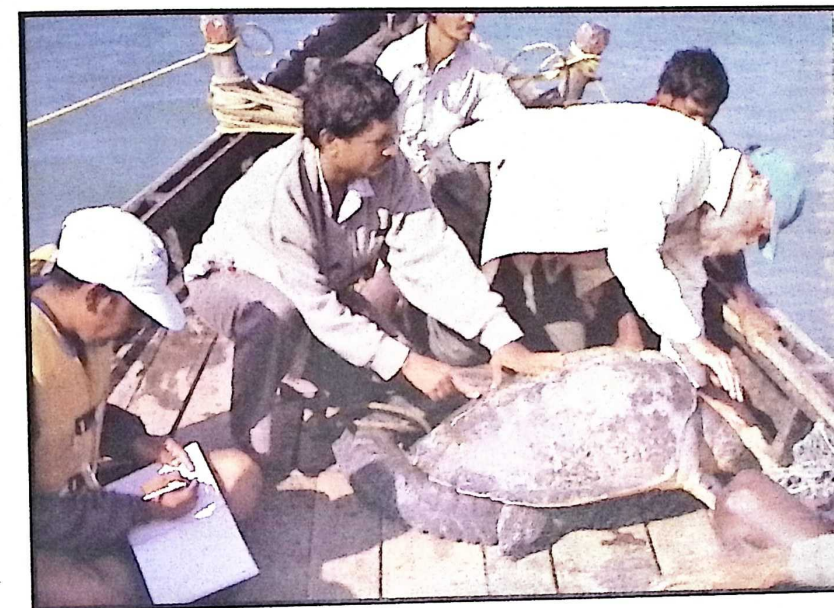
An ecological analysis of critical sea turtle habitats along the Orissa coast for the development of a scientific sea turtle management strategy

Faculty : BC Choudhury

Researcher : Bivash K Pandav

Of the four sea turtle species found in the coastal waters off Orissa, only the Olive Ridley is known to nest - at three mass nesting beaches or rookeries at Gahirmatha (largest known in the world), Devi and Rushikulya which was discovered during WII's survey three years ago. As a follow-up of that survey, this project started in 1995, seeks to do an ecological analysis of critical sea turtle habitats and develop a scientific management action plan to ensure their long-term survival and continued mass nesting along the Orissa coast. While making a scientific evaluation of off-shore breeding habitat and on-shore nesting habitat vis-a-vis biotic, abiotic and anthropogenic impacts, the action plan would include nesting, habitat protection and management strategies, habitat restoration plans, avenues for future scientific research and development of public awareness programmes.

Off shore tagging of Olive Ridley sea Turtles along the Orissa Coast by WII Research Team.



B.C. Choudhury

During the reporting year, the study concentrated on - Olive ridley turtle and marine fisheries interface conflicts in off-shore waters and the resultant mortality of sea turtles; Monel metal tagging of mating pairs and nesting females for inter-rookery and transboundary migration studies; and disorientation of adult nesting and hatching females as a result of the artificial lighting near important sea turtle nesting beaches. The project appointed and trained local university students on many aspects of sea turtle research methodology and through them initiated a major sea turtle conservation awareness campaign by setting four camps along the Orissa coast. The involvement of local youth in the project helped it make an enumeration of all fisheries related mortalities of sea turtles along the coast. The report of the mortalities to the Ministry of Environment and Forests resulted in considering urgent remedial measures by the Government of India and the Orissa State government through suitable legislation and strengthening of the PA management systems.

PROJECTS INITIATED

Ecology and management of problematic sloth bears (*Melursus ursinus*) in North Bilaspur Forest Division

Faculty : Dr NPS Chauhan

Researchers : Prachi Srivastava and Bharat Bhushan

The project was initiated in April 1996. During first three months, the researchers collected bibliographic information on the ecology of sloth bears and problem areas, prepared base maps and digitized them, and developed formats for use in the field areas.

The base camp was established at Pendra in July. Field staff was recruited and work was started on collecting information on the nature and extent of damage caused by bears in the affected areas of Pendra and Marwahi ranges, namely the villages Pakaria, Kolbira, Pathrra, Runga (Thiatola), Barganwa, Lityasarai, Tikpapani, Matiadand, Kargi, Madwahi, Ghusaria, Mimdha, Chaubara, Gullidand, Kirahatola, Suhasindand, Chilhan, Bagarra, Murmur and Khurpa. Also, eightysix fixed transects were laid in the area for vegetation composition studies based on remote sensing

data, and for data on the ecology of problematic sloth bears. Occurrence of live den sites in various dongries: Tendubarrera, Gathonjheria, Baghra, Bahri jorkhi, Barjhorka, Chidradongri, Chinduldongri, Bendramauri, Chundrehila, Hundragarar, Bungmaria dongri, Khilsari dongri, Madwahi dongri, Jogiadand, Ara-Bahra dongri, Damerdongri, Raksha Amli, Jata dongri, Jantapani, Kiratola dongri, Didvababa, Marwahi, Kharvatola, Jandidongri and Murmurdongri in above villages was confirmed.

However, in August, the project faced a setback when both the researchers left because of lack of security in the field area. New researchers are yet to be recruited and this would be done only when security is assured and provided for the field work by the Madhya Pradesh forest department.

An ecological study of sympatric hornbills and fruiting patterns in a tropical forest in Arunachal Pradesh

Faculty : Dr GS Rawat and Pratap Singh
Researcher : Aparajita Datta

In Arunachal Pradesh, five hornbill species occur, three of which are endemic to the north-east India. Most of these are highly vulnerable due mainly to their primarily frugivorous diet and specialized nesting requirements. Therefore, habitat loss/conversion and hunting would greatly exacerbate their natural vulnerability. As hornbills have been found to be important seed dispersal agents of a number of primary forest species, their depletion in numbers or disappearance from forests may lead to the extinction of many of their food plants that depend on mutual existence. As such, before there is further decline in their population, it is important that there be information on their ecology and status. In addition, phenological studies determining the annual patterns of fruit production in the tropical semi-evergreen and evergreen forests of north-east India need to be carried out.

This study, located at Pakhui wildlife sanctuary (western Arunachal Pradesh) and Namdapha tiger reserve (eastern Arunachal Pradesh) would be the first comparative ecological study on sympatric hornbills in India. Field work on this four-year project commenced in March 1997.

The objectives of this study are to (i) document annual patterns of fruit availability in a tropical and sub-tropical semi-evergreen forest in Arunachal Pradesh, and (ii) carry out a comparative ecological study of the sympatric hornbill species to determine the specific grouping and spacing patterns, and characterize their foraging and nesting habitats. After the primary study, a survey of some protected areas in Arunachal Pradesh for hornbill abundance and the identification of threats to each species in different areas is to be undertaken. An assessment of the vulnerability of each species, based on ecological/demographic characteristics and extent of hunting pressure, would be made to delineate a conservation strategy for each species.

This study will help in identifying the extent of seasonality in fruit production in these forests, the alternatives available to hornbill and other frugivorous during lean seasons, (keystone resources if any), the behavioral strategies adopted by the animals to cope with fruit shortages, the existence of any seed disperser specificity between hornbills and some of their food plants, and in understanding factors underlying fruiting patterns by testing certain hypotheses regarding dispersion of fruiting periods.

Bird survey in selected localities of Arunachal Pradesh

Faculty : Pratap Singh

The avifauna of Arunachal Pradesh is phenomenally rich and varied, yet poorly known. This short-term project seeks to survey

six selected remote localities in the State for avifauna and make recommendations for the conservation of threatened and endangered birds and critical habitats.

Initiated in March 1997, the project is supported by the "Forktail Award" constituted by the "Oriental Bird Club"

INTERNATIONAL COLLABORATIONS

WORLD BANK

An ecological study of the Kalakad-Mundanthurai tiger reserve : An ecodevelopment approach

Faculty : Sugato Dutt, Dr AJT Johnsingh and Dr NPS Chauhan

Researchers : Justus Joshua, N Bala Raju, Jayanti Ray, Anupama Pai, Kamini Gopal and Kaberi K Gupta

Wildlife conservation today means providing protection to an entire biodiversity within and around a given protected area. It also includes a concern for the people living in the surrounds in the belief that improvement in their living and economic conditions would lead to an improvement in the wildlife area itself.

Kalakad-Mundanthurai tiger reserve (Tamil Nadu) has been accorded an ecodevelopment programme as part of the World Bank funded Forest Research Education and Extension Project (FREEP), and WII has been identified as the nodal agency for conducting research therein.

Kalakad-Mundanthurai, spanning an altitudinal range from sea level to 1800 mts above msl, boast one of the richest diversity of habitats and forest types. WII's multi-disciplinary research team will make a

detailed inventory of the flora and fauna of the reserve, take a look at the medicinal plants, their use by Kani tribals and the extent of their prevalence in the market. A detailed study would also be done of the slender loris, the main prosimian here. The findings on these issues will eventually help drawing up ecodevelopment programmes for the people living in the vicinity of the tiger reserve.

So far, inventory has been completed of two ranges namely Mundanthurai and Papanasam, while work has commenced in the Kalakad range. In this, varied plant community compositions as well as the prevalent avifauna, herpetofauna and mammal assemblages particularly bats have been recorded. Plant communities with high conservation priority have been delineated and special reference made to areas with low density of prey base as well as high incidence of anthropogenic influences.

An important component of the research programme has related to human resource use. In this context, a study on the effect of fuelwood removal was conducted on the Mundanthurai plateau. This area has extensive tract of dry deciduous forests and is vulnerable due to its proximity to adjoining villages and townships. This study has enumerated the woody species preferred and ranked them in order of priority. Such information, together with regeneration surveys, would convey the current status of the forest ecosystem to the management for appropriate intervention.

It may be mentioned that the field work has continued uninterrupted even as the funding for the project has not been received as yet.



C.S. Rawat

The medicinal value of "Taxus baccata" which fetches exorbitant price in illegal markets abroad has led to its serious destruction.



VB. Mathur

Great Himalayan NP, Himachal Pradesh, where WII is the nodal agency for carrying out research and monitoring under the World Bank FREE-Project.

An ecological study of the conservation of biodiversity and biotic pressures in the Great Himalayan national park : An ecodevelopment approach

Faculty : BMS Rathore, Dr PK Mathur, Dr VB Mathur, Dr GS Rawat, Dr SP Goyal and Dr S Sathyakumar

Researchers : Dr VP Uniyal, Pardeep Kumar, Sunit Naithani, Milind Saxena, Vinod TR, Sanjay K Singh, K Ramesh and Badrish Mehra

This is the second of the World Bank's FREEP in which WII is the nodal agency for carrying out research and monitoring in Great Himalayan national park (GHNP), Himachal Pradesh. The project was initiated in 1994 by Himachal Pradesh, Department of Forest Farming and Conservation (HPDFFC).

GHNP is representative of the western Himalayan flora and fauna, supporting several endangered mammals and pheasants including the endangered western tragopan. There is some human population on the western and north-western boundaries of the park which depends upon the resources inside.

But there is a paucity of scientific information on GHNP, its attributes and biotic pressures.

The project seeks to study GHNP's biodiversity, the impact of livestock grazing, herb collection and other human activities on it and suggest ecodevelopment alternatives to mitigate these pressures. The project would also study the socio-economic aspects of the park dependent people and develop an ecological monitoring system to evaluate the impact and sustainability of ecodevelopment initiatives in the project area which can be continued in the long term.

The multi-disciplinary studies being conducted are also closely inter-related and carried with frequent exchange of ideas amongst researchers, park management and other interest groups. Notwithstanding the financial bottlenecks that remained all through, the field work has made significant headway. The findings from the ongoing work are likely to be shared with a wide range of interest groups including the World Bank Mission in the near future.

US-FWS PHASE I

Ecology and genetics of Himalayan ibex in Pin Valley national park, Himachal Pradesh

Faculty : Dr AJT Johnsingh, Dr GS Rawat, Dr PK Malik and Dr Michael Stuwe
Researchers : Nima Manjrekar and Yashveer Bhatnagar

Dr Stuwe has studied the Alpine Ibex in Switzerland and a Nubian ibex in Israel. It was he who suggested this study on the genetics and ecology of the Himalayan ibex. With the study located in the trans-Himalayan cold desert of Pin Valley national park (3600-6632 mts above msl; temperature -350 to +350C), its findings, while comparing with the findings of Dr Stuwe's other two studies, will also help develop suitable conservation and management guidelines for the high altitude area in general and the Himalayan areas in particular.

The study is now complete. During 1991-1995, extensive data on the ecology of the Himalayan ibex was gathered. Based on the ground-truthing done of IRS LIS-2 satellite imagery in the field in August 1995, a rough vegetation and terrain map was made, using GIS on the satellite imagery obtained for the area. The classification was refined during another visit to the field in August 1996. The final maps were prepared on the ARC/INFO facility available at WII.

The project activities concluded in March 1997, after which a further six months extension was granted. The data on ranging, habitat utilization and feeding ecology of the Himalayan ibex have been analyzed, and the researchers are now writing the final project report. Part of the work on this project was presented at the Annual Research Seminar in September 1996, and for which Bhatnagar was among the awardees. Both researchers are also working on their respective Ph.D theses

emanating from this project, which would be submitted to the Saurashtra University.

Ecology and management of the Indian giant squirrel

Principal investigator : Dr Renee Borges
Researchers : Subhash Mali and Hema Somanathan

Located at Bhimashankar wildlife sanctuary in Maharashtra which supports a good population of the Malabar giant squirrel, this study is investigating the food selection and ranging patterns of the species and examining the relationship between food availability and the animal's reproductive success. The findings will help in developing a management plan for its conservation. The study also involves BNHS, Bombay, and is located in Bhimashankar wildlife sanctuary in Maharashtra.

During 1996-97, the researchers completed their investigations on food selection, ranging patterns of the Malabar giant squirrel. Aspects of food availability and giant squirrel reproduction success was also investigated compiling extensive data on community level pathology of vegetation of the study area and three satellite area. In September-October 1996, Borges interacted with Dr Doyle Mckey, advisor to the project in France and also interacted with various other scientists in the USA, particularly at Universities of Miami and Washington on the project data analysis. The data and materials gathered from the field are currently analyzed at various specialized laboratories. The final project report and two Ph.D thesis are to be completed by September 1997, when the project comes to an end.

Conservation of the Indian Wolf

Faculty : Dr YV Jhala
Researcher : Dr. Dinesh Sharma, Bharat Jetwa & Reema Pandey

The wolf, a major predator in the semi-arid grassland-scrubland habitats of India, is on the

endangered list of Indian fauna. The species is, however, yet to receive attention in the form of detailed scientific studies on conservation and remains widely persecuted. From the limited scientific information available, it is clear that it can be effectively conserved provided efforts begin soon.

This research aims to provide insight into the basic parameters of wolf ecology so as to aid in the formation of a national strategy for its conservation. The specific objectives of the research are to 1) estimate the population and distribution of wolves in India, 2) identify viable wolf populations that need to be conserved, 3) evaluate the population dynamics, food-habits, prey biomass needs, energetics, home range/territory size of wolves in three representative areas - Kutch and Bhal areas of Gujarat and one site in Maharashtra, 4) gain a scientific understanding of human-wolf conflict and suggest ways to reduce the problem, and 5) study the conservation genetics of wolf populations.

The three sites chosen for the study span different aspects of socio-economic and ecological factors that are likely to affect wolf conservation. Wolves from different packs have been radio-collared in the Bhal area. Valuable data on habitat selection for denning and pup rearing, pup and juvenile mortality, food habits, prey populations, human-wolf conflicts, and prey-predator relationships have been collected in the Bhal and Kutch study sites.

A significant outcome of the field research has been the identification of canine distemper as the major cause of wolf mortality in the Bhal area, and as human caused deaths of pups and poisoning of adult wolves in the Kutch area. Some wolf pups from one of the packs in the Bhal area were captured and vaccinated against canine distemper by the Gujarat Forest Department personnel. There has been 100% pup survival in the partly vaccinated pack and 60% pup survival in an unvaccinated pack up to the age of 8 months.

Last year, the human-wolf conflict reached a high with reports of over 50 children alleged to have been killed and eaten by wolves in eastern UP. With the objective of determining the identity of the predator and understanding the likely cause for such aberrant behaviour, we investigated the recent lethal and non lethal attacks on over 70 children in eastern Uttar Pradesh. We examined the remains of killed children, sites of attack and body recovery, autopsy reports and electron micrographs of predator hair. We interviewed eyewitnesses, survivors of attacks, officials and the families of the victims. Data on location and dates of attacks were verified and analyzed to understand spatial and temporal trends. We used an index to quantify availability of wild and domestic wolf prey and assess vulnerability of children to wolf predation.

Our data on tracks and electron micrographs, and the description provided by eyewitness and survivors as well, suggests the child-lifter to indeed be a wolf - and a single wolf at that. Between 17 March and 15 October 1996, the attacks occurred at a frequency of one every third day. On an average, a child was killed every fifth day. The average distance between consecutive attack sites was 13.28 km. (se 1.2 km). The total area where attacks occurred covered 1,390 km².

The region had more vulnerable children as compared to domestic livestock or wild prey. Most killings occurred due to some form of neglect by the parents. All victims belonged to the poorer section of the society and over 50% of them had only their mother to look after them. The age of the children attacked ranged from 4 months to 9 years. We suggested precautionary measures to reduce incidence of lethal attacks and made recommendations on ways to specifically target the child-lifter and avoid unnecessary killing of other wolves. Besides the major grant for the study coming from US-FWS, funds for the study have also been obtained from National Geographic Society, Centre for Field Research (Earthwatch), National Fish and Wildlife Foundation.

PHASE II

Identifying potential areas for conserving biodiversity in the Indian Himalaya.

Faculty : Dr VB Mathur, Dr RS Chundawat, Qamar Qureshi and Don Hunter
Researchers : Rashid H Raza and Meera Anna Ommen

The Himalaya has been recognized as a region harbouring diverse and unique floral and faunal assemblies. But it is inadequately represented in the country's protected area network and is also one of the most actively degrading ecosystems of the country with far reaching consequences of environmental damage. In an area where it is arduous and expensive to conduct large scale surveys of biodiversity, this project was initiated to develop scientifically reliable techniques based on remote sensing and GIS technologies for identifying areas of conservation importance.

The specific objectives of the project are to (1) build a biodiversity model from targeted surveys of vegetation and mammals; (2) apply this model to protected and unprotected areas representing two major biogeographic zones in the Indian Himalaya; and on the basis of this (3) write a biodiversity action plan for the Indian Himalaya.

After field surveys were carried out in Hemis national park (Ladakh, J&K), Govind Pashu Vihar and Kedarnath wildlife sanctuary (both Garhwal, UP), Kedarnath has been decided upon for the detailed study for developing fine scale landscape model. At present research team is doing field work in Kedarnath. The methodologies for data collection have been fine tuned and the researchers are currently in the field collecting data largely for vegetation, birds and landuse



The Elephant movement between Rajaji-Corbett is facing increasing problems due to habitat fragmentation.

pattern. These will be used to evolve conservation evaluation procedures identifying protected areas in the western Himalayas.

Relationships between large herbivores, habitat and humans in Rajaji-Corbett national parks, Uttar Pradesh

Faculty : Dr AJT Johnsingh, Dr SP Goyal, Dr GS Rawat, Dr Asha Rajvanshi and Dr Paul Krausman
Researcher : A Christy Williams

The Shivalik hill ranges, from Jammu in the north-west to Bengal in the east, cover a total area of about 40,000 sq km but it is only the stretch between Yamuna and Kosi rivers in Uttar Pradesh which has abundant wildlife. This stretch also has two well known protected areas - Rajaji national park and Corbett tiger reserve which are home to the elephant and tiger, among a host of animals. However the two protected areas, like most wilderness areas in the country, face the problems of fragmentation because of development projects (Chilla power channel - Rajaji; Ramganga reservoir - Corbett) and severe biotic pressures from the people living in and around them. Information on these would help the wildlife managers to make informed management decisions.

This project will seek to prepare habitat maps, quantify vegetation composition and structure, study herbivore abundance and distribution and quantify people's and their livestock's impact on the habitat. The researcher is working in the Rajaji area determining the distribution pattern of the elephants, estimating their densities and quantifying biotic pressures to establish grades of habitat disturbance. Transects were laid in May-June 1996 for quantifying elephant dung and other habitat variables to study the factors influencing the dry season distribution of elephants in the Rajaji; and two male and two female elephants were radio-collared in December 1996 to study the ranging patterns of individual animals.

The way elephants are distributed in time and space seems to be mainly influenced by disturbance factors and availability of water during the dry season. The availability of *M. philipensis*, an important elephant food plant, also plays an important role in determining the dry season distribution pattern of elephants. The individual winter range size varied from 33.3 km² to 226 km².

Data was also gathered on population structure of elephants in the two protected areas. A total of 263 elephants in Rajaji and 159 elephants in Corbett were classified into various age-sex categories. The adult male:female ratio was 75.2:100 and 46.2:100 for Rajaji and Corbett respectively. Similarly, adult cows:young (1-5 years) ratio was 100:103 (Rajaji) and 100:90.4 (Corbett). To study the impact of elephant and other human disturbance factors on elephant food plants, a number of transects have been laid in the study area.

A Sloth bear immobilised and being equipped with radio-collar, Panna N.P.

Evaluating Panna national park with special reference to the ecology of sloth bear, Madhya Pradesh

Faculty : Dr AJT Johnsingh and Dr Clifford G Rice
Researcher : TRK Yoganand

The sloth bear is a widely distributed large carnivore of the Indian subcontinent, but little is known of its ecology and behaviour. This study, the first of its kind in India, is located in Panna national park, a dry deciduous forest type, which has a good sloth bear population in what is considered an optimum sloth bear habitat. The findings of the study will not only enhance our knowledge on the species but also establish a basis for its conservation.

One sloth bear was radio-collared last year, and four more in April-May 1996 - a prime adult male, a young adult male, sub-adult male, a young adult female without dependant young and a female. These bears were then tracked to study their ranging, habitat-use, food habits, social behaviour and the impact of human disturbance on these aspects of behaviour.

Of the five radio-collared sloth bears, however, two slipped their collars off within a few days of collaring; one sub-adult bear dispersed outside the Panna national park three months after collaring and could not be located subsequently; and an adult male bit and broke



TRK Yoganand

the collar in August 1996. That left us with only one adult female bear to radio-track year round. Trapping was tried again in December 1996 and January 1997 but without success.

Locations of the animals were obtained by homing on them and by triangulation method. Their seasonal home-range areas ranged from 13 to 30 sq.km. During observance, the bears were found to be active only during the night, generally returning to their one of a few regularly used dens to rest during the day.

Sloth bear scats were collected regularly along fixed trails and dens in order to determine their food habits. During Dr Cliff Rice's field visit in January 1997, differential corrected geographical coordinates were found for the regular tracking stations, which would help in minimising triangulation error. An automatic receiver recording unit was also set up to record the diurnal activity of the radio-collared animals, by measuring the pulse interval and strength of the signals from the transmitters.

Impact of fragmentation on the biological diversity of rainforest small mammals and herpetofauna of the Western Ghats mountains, south India

Faculty : Dr Ajith Kumar (SACON), Dr Ravi Chellam, BC Choudhury and Dr Barry Noon
Researchers : Karthikeyan Vasudevan, Divya Mudappa and NM Ishwar

The rainforests of the Western Ghats, over the last several decades have suffered immense habitat loss and consequently, severe fragmentation. Though the existing rainforests have now been brought under the protected area network, fragmentation remains a matter of serious concern, because for many species the effects of fragmentation, manifesting over a long period of time, has the same



Malabar Spiny doormouse (*Platacanthornys lasiurus*) a tiny denizen of the Western Ghats rainforests.

Saravankumar

consequences as extinction. It is extremely important that the management options towards conserving the remnant patches of rainforests be assessed urgently.

The objectives of this study are to (1) identify the major factors governing faunal distribution and abundance in a large, contiguous and relatively undisturbed rainforest; (2) identify changes brought about by habitat fragmentation on topography, soil, vegetation composition and structure, etc. and relate these changes to those in faunal distribution and abundance in the rainforest fragments of Annamalai hills; (3) develop a set of statistical models based on the above two objectives, which would allow the prediction of faunal changes as a function of fragmentation; and (4) carry out a survey across the Western Ghats to validate the predictions of the models.

In May-June 1996, an abandoned plantation building at Sengaltheri in Kalakkad-Mundanthurai tiger reserve was renovated to set up the project field base. Intensive field work is to be carried out at three sites - Sengaltheri, Kakkachi and Kannikatti.

Preliminary field work continued till August 1996, when various field methods were tested to decide the most appropriate method and sampling strategy and to standardize the same. Since in many respects this is the first time that

such an intensive study with a strict quantitative approach is being attempted in India in the rainforests, there were numerous problems in standardizing the methods.

The preliminary data was presented by the three researchers at the Annual Research Seminar in September 1996, for which they were judged among the best presentations.

The researchers returned to the field in October 1996 for intensive field work which involved systematic trapping of rodents, camera trapping of small carnivores, systematic searching for reptiles (including arboreal reptiles) and amphibians, recording of amphibian calls, and specific targeted searches in special microhabitats for herpetofauna.

Initial analysis indicates a much lower trapping success for rodents, amphibians and reptiles than was anticipated. The preponderance of zero quadrats for herpetofauna has resulted in partial modification of the initial methods and adoption of Adaptive Sampling. Dr Noon's visit to the field in January 1997 also led to many useful modifications.

The small mammal work has also begun in the rainforest fragments of Indira Gandhi wildlife sanctuary, Annamalai hills. Work in the fragments for herpetofauna will begin later. Currently data collection is continuing in the contiguous rainforests.

Development of Indian Cooperative Wildlife Health Programme

Faculty : Dr PK Malik

Wildlife health forms an important subject of teaching both in regular courses of WII and the special course in Zoo management, and a vital applied component in most of the institute's research programmes. The institute also interacts with, consults and advises PA managers, state wildlife agencies, animal husbandry departments and veterinary

institutions. But it is not possible for WII to alone address the wildlife health needs of the entire country.

The problems facing wildlife health are actually much larger. Considerable progress has been made in India in disease control among domestic animals, but little has been done in the case of wildlife. Veterinary institutions provide no formal training in wildlife health aspects and therefore local veterinarians can offer little assistance. As a result, when diseases occur in wild animals, mortalities from it become widespread even before they are noticed by which time it is impossible to conduct satisfactory disease investigations and take preventive measures.

Through this project, a nationwide programme has been initiated to address wildlife diseases and related issues in a timely, effective and comprehensive manner. Toward this, a wildlife health programme is being developed to advance the capabilities of select veterinary medical institutions in teaching a course in wildlife health, providing diagnosis and investigation of disease outbreaks, prevention and control of diseases in the free ranging wildlife, information exchange, education and consultation with wildlife managers, biologists and veterinary medical specialists.

Dr RG Jani, Asstt Professor, Anand Veterinary College (Gujarat) completed his training in wildlife management and health in May 1996. After him, Dr SK Mishra, Associate Professor, Hissar Veterinary College (Haryana) joined WII's Diploma Course in Wildlife Management for the same training. With this, the number of such trained officers has become five, all from different parts of the country. These personnel have been designated Wildlife Health Coordinators (WHC) of the Indian Wildlife Health Cooperative Centres (IWHCC) in their respective areas.

During 1996-97, the IWHCCs at Anand Veterinary College, Gujarat (Western Region), Guwahati Veterinary College, Assam (Eastern

Region), Madras Veterinary College, Tamil Nadu (Southern Region) and Jabalpur Veterinary College, Madhya Pradesh (Central Region) have been provided infrastructural support in the form of field vehicles and equipments.

IWHCC (Southern) has established a Wildlife Medicine Department at Madras Veterinary College and is currently designing a two-year course for MVSc in Wildlife Medicine. It is also developing a proposal to investigate health and disease conditions of domestic elephants in Tamil Nadu; and did the serological screening of serum samples of canids collected in WII's project on the wolf.

IWHCC (Central) provided additional support to WII's project at Panna during immobilization and radio-collaring of tigers. It is also conducting a study of musk deer anatomy and serological investigation of captive musk deer, including a vaccination clinical trial for WII's project on this species in Kedarnath wildlife sanctuary. The WHC here has conducted investigation into the causes of captive tiger mortalities in Madhya Pradesh and developed a project on sero-epidemiological study of some endangered wildlife species in the state.

During 1996-97, the IWHCC (Eastern) conducted a vaccination programme on domestic livestock in and around Kaziranga national park. In collaboration with the State wildlife department, it is setting up an ICAR supported health monitoring project for wild and captive wildlife in the same national park.

Establishment of a wildlife forensic capacity at the Wildlife Institute of India

Faculty : Dr SP Goyal and SK Mukherjee
Researchers : Dr Archana S Kumar and Nicky Xavier

The international illegal trade in endangered species alone is valued at about 1-2 billion dollars per year. There are laws against

poaching but these are often improperly enforced. This is particularly as biological remains such as blood stains, hair samples, small meat pieces, bones or highly processed products confiscated from culprits cannot be identified on the basis of morphological characteristics but need forensic techniques for identification. However, in India, such techniques have generally not been available to wildlife offenses and investigative and analytical procedures related to wildlife have not been developed. Moreover, there are neither adequate reference material and standardized methods necessary to identify species nor have any systematic studies been done in this direction.

WII had successfully conducted a project to standardize forensic techniques and strengthen its laboratory capabilities in identifying species from biological samples. On the gains of that research, this project was initiated to develop this facility at WII, including developing identification procedures and collecting a body of reference material for the vertebrate species.

For species identification, hair are examined through cross section, cuticular patterns by making imprint on slide using gelatine or 15% Polyvinyl alcohol and medulla pattern under simple research microscope or Scan Electron Microscope (SEM). In addition, hair thickness and other measurements are taken. All these variables have been measured for ibex (*Capra ibex*), blue sheep (*Pseudois nayaur*), Tibetan antelope (*Pantholops hodgsoni*) and Pashmina goat. The project is preparing protocols to identify hair of Tibetan antelope which when done will be made available to various forensic laboratories as well as enforcement agencies.

The project supervisor and a researcher completed a training on use of "Geoanalytical techniques" at Wadia Institute of Himalayan Geology, Dehra Dun. Work has been undertaken to characterize deer antlers and musk powder collected from musk pods based on X-ray diffraction.



CS Rawat

The pitcher plant found in Meghalaya is an endangered species.

USDA FOREST SERVICE

Management of forests in India for biological diversity and forest productivity - An Ecological Perspective

Faculty : VB Sawarkar, SK Mukherjee, Dr PK Mathur, Dr SP Singh, Ajai Saxena, DVS Khati and Sugato Dutt

Researchers : Dr Anjana Pant, Dr NK Ramchandra, Geeta Sunal, Ashish Kumar and Harish Kumar

The aim of this project is to evolve approaches and practices for integrated forest management planning which are essential for the conservation of biodiversity and enhanced productivity of forest ecosystems. The project commenced last year and is being carried out at select sites in five states - Balaphakaram and Nokrek national parks and Siju wildlife sanctuary in Meghalaya; Dudhwa national park and surrounding areas in Uttar Pradesh; Satpura national park, Bori and Pachmarhi wildlife sanctuaries and the forests of Hoshangabad, north, east and south Betul forest divisions in Madhya Pradesh; Melghat tiger reserve and the forests of east, west and south Melghat divisions in Maharashtra; and Indira Gandhi national park, Annamalai wildlife sanctuary and surrounding forests in Tamil Nadu. These sites represent a diversity of ecological, managerial, socio-cultural and economic challenges necessary for testing a range of options and technological templates. It is intended for these sites to serve as demonstration models leading to the development of management tools and a field guide.

After their orientation, the researchers set about their initial reconnaissance, setting up logistics and contacts, collection of secondary information and developing investigation protocols with the supervising investigators working alongside on the identified four project areas - Garo Hills, Terai, Satpura and Annamalai conservation areas (CAs). A Planning Workshop was held at WII in June 1996 to formalise the strategies and set up a

framework of schedule. The State forest departments have provided facilities of field stations, staff support and logistics and have appointed nodal officers for each of the sites. Investigations continued on all sites.

In March 1997, four counterpart US Forest Service scientists arrived in India - two for Satpura CA, one each for Annamalai CA and Terai CA. The WII faculty and researchers worked alongside the USFS scientists at the various project sites. Towards the end of their 25-day assignment, project strategies were further fine tuned and a framework for field guides was established. It was also decided to revise the schedule set under the Planning Workshop since there was no possibility of securing additional funding as had been proposed during that workshop. Broad changes were agreed upon.

FORD FOUNDATION

Building partnership for biodiversity conservation in Rajaji national park, Uttar Pradesh

The project is based on the premise that in a complex situation as in Rajaji, there needs to be a pragmatic approach to biodiversity conservation. This would need an environment of mutual trust and confidence among the key stakeholders to help them solve the problems affecting both habitat and local communities. It is only in such an environment that the precepts of ecodevelopment can have any lasting solutions to the problems. This project, being funded by the Ford Foundation, New Delhi seeks to build the capacity and competencies of the key partners i.e. the local community and the park personnel so that they are able to forge effective partnerships. The role of the institute here would essentially be that of a facilitator - bringing together the key partners on a common platform, developing an institutionalized coordination mechanism, and doing capacity building and resource mobilization.



BMS Rathore

For the people living around Rajaji NP, Bhabhar grass provides an important source of livelihood.

ORGANIZATION

The WII Society has 35 members, headed by the Union Minister for Environment and Forests. Other members include some State forest ministers, nominated MPs and MLAs, officials from several central government ministries and departments, NGO representatives and eminent individuals.

The actual functioning of the institute is directed by a 15-member Governing Body, presided over by the Secretary, Ministry of Environment and Forests.

DEVELOPMENT

UNDP Collaboration

The government of India and UNDP collaborated on a project which was aimed at "Strengthening wildlife management and ecodevelopment planning capabilities" within Union and State wildlife agencies. It was started in December 1992. Under the project

two courses each were conducted on Wildlife Management Planning and on Ecodevelopment Planning, for officers of the various protected areas, then designated Field Planning Officers (FPO). Subsequently, these FPOs, with the assistance of project faculty, and national and international consultants, prepared the actual plans for their respective areas totalling 14 sites.

The project was to end in December 1996. The Evaluation Mission of UNDP visited WII and a few of the field sites in November 1996, during which a workshop, attended by Chief Wildlife Wardens and Field Directors from some states, FPOs from the various sites and representatives of UNDP, FAO, WWF and other NGOs was held. This was followed by a Terminal Tripartite Review meeting at New Delhi. The Evaluation Mission stated, "Given the positive developments achieved by the project, it is recommended that there be an implementation stage of one or two of the ecodevelopment plans." Based on such recommendations, the project has been granted an extension till June 1997.



Faculty members in meeting with a UNDP delegation at the final review of WII-UNDP joint collaboration on "Strengthening Ecodevelopment Planning and Management Planning Capabilities".

Vinod Verma

SERVICE AND FACILITIES CONSULTANCY

Environment impact assessment

In response to the mandatory need for environmental impact assessment (EIA) of development project, and encouraged by its own experiences in carrying out such assessment in three large projects, WII created a separate EIA cell. The offers to this cell from various government and non-government agencies to conduct pre-project assessment studies on the impact of development projects on wildlife values have been increasing.

During the year under reporting, the EIA Cell continued to diversify and expand. Among the agencies seeking this cell's consultancy on environment and site appraisal studies, are Engineers India Limited, Bongaigaon Refinery and Petrochemicals Ltd., Gujarat Mineral Development Corporation, and Andhra Pradesh Electricity Board.

In 1996-97, the following studies were conducted and their reports submitted to the

respective clients: (i) Environmental Impact Assessment of Oman India Pipeline Project with Special Reference to Impacts on Wildlife Values; (ii) An Evaluation of the Proposed Nuclear Power Station at Nagarjunasagar with Special Reference to its Conservation Value; (iii) Ecological Assessment of Proposed Hydrotreatment Plant at Bongaigaon; (iv) Ecological Impacts of Lignite Mining in Kutch with Special Emphasis on the Indian Grey Wolf and its Habitats.

The EIA Cell also extended technical support to several agencies in their capacity building for ecological impact assessments. These include Mine Service, Nagpur; Barkattulaha University, Bhopal and Steel Authority of India.

The institute continues to extend technical and advisory support to the Environment Division of the Ministry of Environment and Forests, Govt. of India in matters related to environmental impact assessment of development proposals. In this regards, Dr Asha Rajvanshi, Faculty Incharge, EIA Cell, represents WII on two expert committees (Mining and River Valley Projects) of the MoE&F.



Industrial development, particularly in or around wilderness areas needs to be assessed for its impact on the environment.

Asha Rajvanshi

Management of elephant populations

At the invitation of West Bengal Forest Department, WII has formulated a consultancy project titled "Developing approaches for the management of elephant populations in West Bengal for mitigating man-elephant conflicts". This would be part of the World Bank funded West Bengal Forestry Project and is being carried out in two major elephant habitats in north and south Bengal. Last year, two important corridors in north Bengal were delineated and four elephants radio-collared. This year three more elephants were radio-collared in the two areas.

The location data generated from seven radio-collared elephants has provided a lot of information on movement, habitat utilization, conflicts and corridor utilization. At present, ground data transfer into the Geographical Information System (GIS) is in progress to develop a spatial data base for north and south Bengal. This work is progressing in collaboration with Regional Remote Sensing Service Centre, Kharagpur. After this, the final report will be written.

Study on management of Rhinoceros in West Bengal

The Wildlife Institute of India formally signed a contract with the West Bengal Forest Department on 17 April, 1996 to undertake and complete a study on the ecology and management of the rhinoceros addressing two protected areas namely Jaldapara Wildlife Sanctuary and Gorumara National Park in West Bengal in which population of the Indian Great One-horned Rhinoceros (*Rhinoceros unicornis*) exist. Field work began during May 1996 with full participation of a consultant in the rhinoceros population estimation exercise, both in Jaldapara and Gorumara. Ecological investigations continued thereafter. As per the terms of contract the field work was to be concluded by the end of March 1997 but the period was extended to September 1997 without additional financial implications. As the

study envisages chemical immobilization of wild rhinos, collection of blood and skin biopsy samples and DNA Fingerprinting analyses, WII developed a collaboration with the National Institute of Immunology (NII), New Delhi. Prior to field operations on the wild rhinos, two male captive rhinos were immobilized in February 1997 at the National Zoological Park (NZP), New Delhi. The blood samples obtained from these captive rhinos were utilized for standardization of laboratory techniques process.

OTHER CONSULTANCIES

Training package for frontline staff

The World Bank supported Madhya Pradesh Forestry Project aims to develop a competency based training package (CBT) for frontline staff in wildlife management. The process began with setting up a core group of three WII faculty members and several middle and senior level forest managers from MP. A questionnaire was developed and administered across several PAs to ascertain the role of the frontline staff. It was also considered important to carry out a need assessment, write down the competencies from a comprehensive need assessment, develop performance standards, also develop course structure and learning resources to help trainees achieve competence against the agreed standards. After carrying out of the need assessment, the members of the core group met in two workshops at Kanha and then in Bhopal and developed several modules under the CBT programme. The draft proposals have since been completed.

India ecodevelopment project

As part of the India Ecodevelopment Project under GEF funding, faculty members in the Ecodevelopment Planning Cell visited Periyar, Ranthambore, Pench and Gir in connection with workshops organized at these sites for evolving research strategies and management planning strategies.

Uttar Pradesh forestry project

Under this project, work was started on two consultancy assignments - "Selection of NGO motivators as spearhead team" and "Training of spearhead team" for ecodevelopment.

Veerangana Durgavati Van Vihar, Madhya Pradesh

A short survey was conducted in "Veerangana Durgavati Van Vihar", a recently declared wildlife sanctuary in Madhya Pradesh. The objective of the survey was to provide recommendations for future protection of the area.

Herbivore problem at airport

The 'Nal' airport near Bikaner is facing problem from herbivores chinkara living in its vicinity and posing a grave threat to the taking off and landing of aircrafts. Dr NPS Chauhan looked into the matter. While suggestions for immediate action to rid the airport of the problem were made to the airport authority, the issue needs to be systematically investigated to formulate long-term mitigation strategies.

Monkey menace

Dr NPS Chauhan also looked into the menace being created by monkeys in the Tehri Garhwal district and in the urban areas of Rajasthan and provided technical guidance. The problematic monkeys and langurs need to be immediately captured using box traps and released in forest areas far and away from human habitations. A similar complaint was received from the Principal, Doon Cultural Centre and High School, Dehra Dun. It was suggested that an electric fence be erected to keep the monkeys away. This has since been constructed by Ibex Gallagher, Bangalore and is proving effective. It was also suggested to capture the monkeys in box traps with the help of professional trappers and release them far away in forest areas.

Resource and teaching support

- The UP Forest Department organized a workshop on "Biodiversity Conservation and Ecodevelopment Planning for Protected Areas of Uttar Pradesh" at ICFRE, Dehra Dun (27-29 May 1996). Ruchi Badola, Scientist SD (Ecodevelopment) participated in this workshop as a resource person.
- The Madhya Pradesh Forest Department organized a 3-day "Wildlife Appreciation Course" at Kanha national park (20-22 June 1996). The main thrust of the course was on the concepts of biodiversity, wildlife in managed forests and incorporation of wildlife information in forest working plans. It was attended by over 25 senior level forest officers (Working Plan officers, CFs, CCFs, Addl.PCCFs). Dr PK Mathur, Scientist SF (Management) was invited to the course as a resource person.
- The Army Sub-Area Command, Dehra Dun organized a "Wildlife Orientation Course" for senior army officer at Rashtriya Indian Military College, Dehra Dun (August 1996). Dr PK Mathur was invited as a resource person. He delivered a talk on the "Biodiversity Conservation - Problems and Prospects".
- Dr Ravi Chellam was invited (5-7 October 1996) by the Wildlife Department of Chandigarh to give a talk on his work with the Asiatic lions and also conduct a quiz competition for schools in the union territory. This was held as part of wildlife week celebrations there.
- At the "Integrated Conservation and Development Workshop" held at Cagen de oro, Phillipines (15-25 October 1996), BMS Rathore participated as a resource person. This workshop took up from the earlier workshop at Nepal, and was attended by 30 participants from Asia and Pacific regions. The range of issues covered in the workshop included assumptions on

integrated conservation and development programmes (ICDP) on the one hand to livelihood options in ICDP on the other.

- AK Bhardwaj, Scientist SE (Ecodevelopment) was a resource person during three refresher courses organized by State Forest Service College, Dehra Dun for in-service officers of various states. He also acted as a resource person for the Volunteers of Attapady Project of Kerala during November 1996.
- Two faculty members provided major inputs in a workshop "Wildlife and Ecodevelopment Planning" conducted in Kanha National Park (5-8 December 1996). In all 57 participants attended including NGOs, and representatives of private tourism resorts.
- At an international workshop on "Community Based Conservation" at New Delhi (9-11 February 1997), BMS Rathore was present as a resource person. The conference was attended by representatives from within the country, Sri Lanka, Pakistan, Nepal, Bangladesh, the IUCN HQ Switzerland, WWF representatives from Switzerland, IIED (UK). Rathore presented a paper titled "New partnership in conservation - Rajaji national park".
- Under the World Bank supported MP Forestry Project, the Madhya Pradesh Forest Department organized a two-day seminar on "Wildlife Research Needs in Madhya Pradesh" at SFRI, Jabalpur (20-21 February, 1997) for PA managers and other scientists. The idea was to identify the research needs in the state, assign priority and formulate a research strategy. WII's Dr PK Mathur, Scientist SF (Management) acted as the external resource person at the workshop. He assisted in the process of identification of wildlife research topics and did a presentation on the criteria for research prioritization.
- The State Forest Service College, Dehra Dun organised a Refresher Course focusing on "Biodiversity Conservation" for Senior SFS officers (February 1997). Dr PK Mathur was a resource person at this course and delivered a talk on "Grassland Biodiversity", discussing the diversity of grassland habitats, endangered species, conservation issues and their management approaches.
- The Kerala Forest Department conducted a workshop on "Biodiversity Conservation Planning and Research Strategy Formulation of the Kerala Forestry Project" at Trivandrum (3-5 March 1997). The workshop was attended by 70 participants including former and serving senior forest officers, representatives of several scientific organizations and NGOs. VB Sawarkar, Head (Management) was a resource person at this workshop and provided inputs on Landscape approach to maintenance of biological diversity.
- Dr YV Jhala, Scientist SE (Biology) and Dr RS Chundawat, Scientist SD (Biology) were resource persons at the "Tiger Field Assessment Workshop" in Royal Chitwan national park, Nepal (15-21 March 1997).
- BMS Rathore, Head (Ecodevelopment) acted as resource person to the Trainee Officers of Indira Gandhi National Forest Academy and State Forest Service College, Dehra Dun. He was also a resource person for the foundation course for the IAS probationers at Lal Bahadur Shastri National Administration Academy, Mussoorie. Rathore also delivered lecture to the officer of the UP Forest Department at Lucknow.
- A consultancy based research project was undertaken to assess the environmental impact of three proposed lignite coal mines in Lakhpat taluka of Kutch (Gujarat) on wildlife - and wolves and their habitats in particular. Dr YV Jhala, Scientist SE

(Biology) undertook this study. The proposed mine sites were found to have a high wildlife value. The study found the presence of five critically endangered wildlife species including wolves, caracal, and the great Indian bustard using. The report recommended not to permit mining in the Mata-no-Madh area and suggested mitigatory measures to minimize impacts on wildlife and their habitats at the other two proposed mining sites.

- Dr Asha Rajvanshi, Faculty Incharge - EIA Cell provided teaching inputs on the subject of environment impact assessment in the following external training programmes : (1) Special refresher courses on "Forestry and Rural Development" for in-service State Forest Service Officers; (2) Regular training programme of the Indira Gandhi National Forest Academy; and (3) Training course on Environmental Management of Mined Areas, for Senior Executives of Steel Authority of India, organised by ICFRE. Broad EIA principles and conceptual framework, and methodological approaches for EIA of forestry, mining and river valley projects and mitigation planning were the specific subject areas in which the inputs were provided.

COMPUTER AND GIS

The computer facilities at WII, among the best in the country in the field of wildlife studies, services the training, research, database, cartography including GIS, digital image processing of remotely sensed data and desktop publishing needs of the institute. Besides, the computer centre conducts training courses on the use of computers and various software packages for the officers trainees of diploma, certificate and other courses/ workshops, for researchers, faculty and other staff of the Institute.

During 1996-97, these facilities were further strengthened by the procurement of new hardware/software and upgradation of its old systems through funding from WII Grant-in-Aid, UNDP, USFWS and USFS projects. A total of 19 Pentium systems and five notebooks were procured, along with a HP Designjet 750C inkjet plotter, 10 Dot Matrix Printers, 10 ink jet printers, one 7 CD-ROM drive tower and 29 650VA UPS systems. Out of these, five computers with printer and UPS systems were allotted to the five Indian Wildlife Health Cooperative Centres under the USFWS collaborative project "Development of an Indian Cooperative Wildlife Health Programme". One SUN Ultra1 with 64MB RAM, 4GB HDD and 20" colour monitor along with Arc/Info and ERDAS software was also procured. Ten old 286 systems were upgraded to Pentium systems. Eighteen 0.5 KVA TVSE UPS systems were upgraded to 650VA APC BackPro UPS systems. At present the Institute has 2 file servers, 2 Sun workstations and 115 nodes on the Local Area Network.

Mr Steve Beckwitt, FAO consultant on GIS, was in the institute twice during the year - May-June 1996 and October-December 1996. During his stay here, he conducted training courses on Arc/Info for the computer personnel of the institute. He also provided assistance in developing configurations for the newly acquired hardware/software; and did GIS analyses for some of the research projects of the Institute.

The Institute has developed and put up a home page on the internet via Smithsonian Institute, Washington DC. The URL (Uniform Resource Locator) for this is http://www.si.edu/organizational_centers/wii.

LIBRARY AND DOCUMENTATION

Befitting WII's status as a leading regional institution involved in the education and training of wildlife conservation and management, its Library and documentation centre serves the knowledge and information needs of its faculty, researchers and other students and trainees. Apart from the lending and reference services, the library and Documentation Centre provides current awareness service, retrospective search service, bibliographic service on demand and anticipation, inter-library local service and photocopying service. These services are also available to outsiders on payment. In fact, during 1996-97, the library responded to about 250 queries received from external users. A separate "children section" has been established to nurture environmental awareness among children.

In 1996-97, 1200 books/monographs, 300 reprints and 1200 newspaper clippings were added, raising the stock to about 15,000 titles in books/monographs, about 7000 reprints and just as many topographic maps. Besides, about 300 national and international journals and periodicals are received regularly. During the year, database of WII serial holdings, bibliographical compilations, and a Directory of Forestry Education in India (for Govt of India) were made.

LABORATORY

The laboratory at WII was established to analyze the samples from the field so as to support research work and also use these samples in different training programmes. As such, there are two sections in the laboratory - teaching and research. Laboratory practical for the institute's various courses

are conducted in the former, while in the latter, facilities are available for protein estimation of plant samples, fat estimation, energy value determination, pH value, carnivore scat analysis, herbivore faecal pellet analysis, etc.

During 1996-97, 62 plant samples from West Bengal Forestry Project (elephant management) were analyzed for calorific value, crude protein, organic carbon and 30 plant samples were analyzed for acid detergent fibre, acid detergent lignin and ash. Thirty samples collected from Pin Valley national park were analyzed for calorific value and acid detergent fibre. Calorific value and organic carbon were determined for 80 bark samples collected for Pench tiger reserve (Madhya Pradesh). Twenty samples were analyzed for calorific value for the project on arboreal mammals in the north-east.

Besides, 19 wildlife offence cases were referred to WII by various agencies. Of these five cases were successfully identified and reported. Efforts are also on to develop a photo album based on hair characteristics, for identification of mammals and standardizing the technique for identification of antlers. Work on computerisation of stock entries of various laboratory and field equipments is in progress.



The research laboratory at WII housing animal remains and specimens draws students from various universities and college.

Vinod Verma

HERBARIUM

The herbarium at the institute houses angiosperm, gymnosperm and fern samples collected by students, researchers, trainees and faculty members from the various protected areas all over the country.

During 1996-1997, plant specimen were received for identification, mounting and processing from Panna national park (Madhya Pradesh), Great Himalayan national park and Kibber wildlife sanctuary (Himachal Pradesh), and Kedarnath wildlife sanctuary and Bhagirathi valley (Uttar Pradesh). The herbarium staff also helped in detailed floristic survey of Jaldapara wildlife sanctuary and Gorumara national park (West Bengal) and updating the plant checklist for these areas. One set of well labelled, mounted and identified plant specimens from Great Himalayan National Park was presented to the Park Director.

Computerized accessioning of plant specimens in the herbarium and database on threatened plants are being updated.

AUDIO - VISUAL UNIT

The Extension Faculty maintains an audio visual unit having a pool of still and video cameras and their accessories, slide projectors, 16 mm film projectors, overhead projectors, TV, VCR and PA systems, and a photo library containing films, colour slides and photographs. There are facilities for computer aided and video panoramic projections. These equipments and facilities are extensively used as teaching aids in classrooms as well as in the fields and also during conferences, seminars, workshops and other august gatherings.

During 1996-97, five new video films were procured and about 900 colour transparencies added to the unit's photo library, bringing its total to about 11,000 slides and over 5000 colour negatives on general and specific wildlife subjects, besides institutional coverage.

A dual projector slide programme depicting the activities of the AV unit was developed inhouse. A "Workshop on Multimedia Presentation : Latest Concepts and Technologies" was organized by Ms Barco Electronic Systems (P) Ltd at the institute on 16 January 1997. Besides the faculty and alumni of WII, representative of the various government organizations in the town also attended this demonstration to understand the techniques and use of different tools required to create a successful and persuasive presentation.

PUBLICATIONS

In order to disseminate scientific information to field managers, wildlife biologists, teachers and voluntary organizations, WII brings out technical reports, workshops proceedings and field manuals from time to time. During 1996-97, the report on "A Status Survey of Olive Ridley Sea Turtle (*Lepidochelys olivacea*) and its Nesting Habitats along the Orissa Coast, India" was published and issued as a priced publication. Regular publications included Annual Report 1995-96 and WII Newsletter (Volume 3, Nos 2, 3 & 4; Volume 4, No 1).

WILDLIFE WEEK CELEBRATION

As a part of the Wildlife Week (first week of October) celebrations, WII organized a drawing competition for the children of Chandrabani village on 4 October 1996. It is often seen that, before appearing in such competitions, the children usually consult parents and others at home and in the neighbourhood. Thus the message of conservation spreads from one person to many in the society. Organizing of the drawing competition provided us an occasion to educate and motivate the children of our campus and neighbourhood, and their parents and neighbours towards the cause of conservation. The theme for the competition this year was "Wildlife/Nature Conservation". Altogether, 36



S. Wilson

A drawing competition organised by WII for village school children during Wildlife Week celebrations.

children in the age group 4-14 years participated in this competition. The winners were awarded with prizes. Afterwards, the children were shown a few wildlife films.

SPORTS AND OTHER EXTRA-CURRICULAR ACTIVITIES

- The WII cricket team continues to do well. In 1996-97 it won the High Power Civil Services Cricket Tournament organized by the Survey of India, Dehra Dun; and reached the semi-finals of the Dehradun District Cricket Tournament organized by Dehradun District Cricket Association. Two members of the team - Manoj Kumar Agarwal and



S Wilson

WII's sports team which participated at the Annual All-India Forest Sports & Games Meet.

Manish Gurung were selected to play for the UP Civil Services Cricket Team at the All India Central Civil Services Cricket Tournament, held at Agartala (Tripura) in February-March 1997.

- As in ensuing years, WII participated at the 5th All India Forest Sports and Games Meet, held this year at Bhopal in January 1997. The WII contingent included 23 players covering various disciplines. It won the silver medal in cricket and bronze medal in rifle shooting (MD Choube), besides the second prize at the cultural competition (Suneet Naithani).

CAMPUS DEVELOPMENT

The construction of New Hostel Block for 40 officers, staff and faculty houses consisting of Type I (12 Quarters), Type II (4 quarters), Type III (4 quarters), Type IV (6 houses) and Type V (4 houses) respectively have been completed during 1996-97 at an executed cost of Rs 2,28,74,548/- (Rupees two crore twentyeight lakhs, seventyfour thousand five hundred fortyeight only). Minor works comprising provision of road, electrification, service connection in the New Hostel Block, and in faculty and staff houses, external water supply and construction of deck slab over the stormwater channel in block IV were taken up and completed within the year 1996-97. A model structure of Portacabin to accommodate Forensic Laboratory alongwith AC facilities was erected in the campus during the year.

VISITORS

- The Director, Department of Wildlife Conservation, Sri Lanka; at the convocation of the Special Diploma Course in Wildlife Management for Sri Lankan forest officials; April 1996
- Dr Pal Gupta, Dean, Hissar Agricultural University, Haryana; 12 July 1996
- Sh Zosiama Pachuau, Forest Minister, Mizoram; 29 July 1996
- Sh TM Maskey, Director General, Nepal; 25 September 1996
- Sh Jai Narain Prasad Nishad, Union Forest Minister, Govt of India; 25 October 1996; to attend the Annual General Meeting
- Dr David Fergusson, SFCP Coordinator, US-FWS, USA; 28 October 1996
- Dr G Thimmaya, Member Planning Commission; 28 October 1996
- Students, Jivaji University; 4 November 1996
- Standing Committee of Parliament on Science and Technology - Environment and Forests; 15 November 1996
- Students, North Eastern Regional Institute of Science and Technology (NERIST), Itanagar, Arunachal Pradesh; 16 December 1996
- Nepal delegation; 29 January 1997; to discuss future collaboration work with WII
- Arun Shourie, eminent journalist; 20 February 1997
- Sh Grivvle, Australian High Commissioner to India; 4 March 1997



Viond Verma

A parliamentary standing committee on Science and Technology - Environment and Forest visited WII in November 1996

With WII completing 10 years of autonomy, the Governing Body appointed a sub-committee to review all the existing rules and suggest changes and modification etc. where considered necessary. Also, considering the new challenges facing us, an internal review is being done to formulate a strategic plan for the institute which will represent the combined insight, synergy and forward thinking of institute's employees and its stakeholders. Meanwhile, clearance has been given to fill up posts of groups D, C & B for which Recruitment Rules are available. We hope in 1997-98, all remaining posts as approved in EFC of VIII Plan will be filled up.

As the institute is growing rapidly, need is being felt for more space. We propose to start construction of at least one modular building to fulfil this much needed demand for adequate space for the institute's functioning.

Institute's training, research and academic activities will continue, and to give a better understanding of the issues, the following short courses and training workshops, some new and some old, have been planned for the coming year:

- Biodiversity conservation of PA managers
- GIS application
- Tourism management
- Wetland habitat management
- Biohabitat evaluation (EIA)
- Biodiversity conservation and sustainable development
- Wildlife law in forest

- National workshop on ecodevelopment
- Interpretation and conservation education
- Chemical restraint and radio-telemetry on free ranging animals

WII's collaborative work with US-FWS, US Forest Service, Ford Foundation, World Bank supported FREE Project and Forestry Project for Madhya Pradesh, West Bengal, Maharashtra and Uttar Pradesh will continue as per already planned work schedule. Similarly, tasks assigned to WII from the Ministry of Environment and Forests under India Ecodevelopment Programme of GEF is likely to be completed in time. There is a possibility that the remaining tasks under GEF programme i.e. national level coordination of management, training and research will also be taken up by WII. A preparatory phase of work plan will also be developed to bridge time between end of present FAO-UNDP plan and start of FAO-UNDP new plan of implementations of PA management plan as visualised during the terminal review of the project.

The EIA Cell, in view of its increasing work and responsibilities, needs strengthening. We also plan to finalise signing MOU with the Ministry of Environment & Forests to start Wildlife Envis Centre and get an internet connectivity for WII.

On the publications front, besides the regular publication of scientific papers, articles and Newsletter WII, there are also plans to bring out a few research bulletins during 1996-97.

S. Mukherjee

SK MUKHERJEE

Papers and articles

Datta, A (1997) - Records of turtles from Pakhui Wildlife Sanctuary, Arunachal Pradesh, north-east India; Journal of Bombay Natural History Society.

Datta, A and SP Goyal (1996) - Comparison of forest structure and use by the Indian giant squirrel (*Ratufa indica*) in two riverine forests of Central India; Biotropica, 28(3): 394-399.

Goyal, SP, B Sinha, N Shah and HS Panwar (Accepted) - Sardar Sarovar Project - A conservation threat to the Indian wild ass, *Equus hemionus khur*; Biological Conservation.

Hussain, SA (1996) - Group size, group structure and breeding in smooth-coated otter *Lutra perspicillata* Geoffroy (Carnivora, Mustelidae) in National Chambal sanctuary; Mammalia 60(2):289-297.

Hussain, SA, PK Malik and BC Choudhury (1996) - Chemical immobilization of smooth-coated otter (*Lutra perspicillata*) by ketamine and xylazine hydrochloride; Journal of Bombay Natural History Society; 93(2): 214-218.

Jhala, YV (Provisionally accepted) - Seasonal effects on the nutritional ecology of blackbuck; Journal of Applied Ecology.

Johnsingh, AJT (1996) - A barren stage - Efforts in China's Wuyishan reserve; Frontline, 5 April 1996.

Johnsingh, AJT (1996) - Call of the wild; The Hindu; 23 June 1996

Johnsingh, AJT (1996) - Tracking the lions of Gir; The Hindu; 29 September 1996.

Joshua, J and AJT Johnsingh (1995) - Ranging patterns of elephants in Rajaji national park: Implications for reserve design; In, A week with elephants; Proceedings of the International seminar on the Conservation of Asian Elephant held in Mudumalai Wildlife Sanctuary, South India, 13-15 June 1993; JC Daniel and Hemant S Datye (Eds.); Bombay Natural History Society; Oxford University Press, Oxford; pp. 256-260.

Khan, JA, Ravi Chellam and AJT Johnsingh (1995) - Group size and age-sex composition of major ungulate species of Gir lion sanctuary and national park, Gujarat, India; Journal of Bombay Natural History Society 92: 295-302.

Khan, JA, Ravi Chellam, WA Rodgers and AJT Johnsingh (1996) - Ungulate densities and biomass

in tropical dry deciduous forests of Gir, Gujarat, India; Journal of Tropical Ecology; 12: 149-162.

Maity, SK and AK Sardar (1996) - Opportunities galore; In, The Hindustan Times; 16 April 1996.

Mishra, C and AJT Johnsingh (1996) - On habitat selection by the goral *Nemorhaedus goral bedfordi*; Journal of Zoological Society of London; 240: 573-580.

Raman, TRS, C Mishra and AJT Johnsingh (1995) - Survey of primates in Mizoram, north-east India; Primate Conservation; 26: 59-62.

Rana, MS (1996) - Internet perspective for information services; In, Library Herald; 32(3-4), pp 115-119.

Rawat, GS, RS Chundawat and S Sathyakumar (1996) - Conservation planning and management of protected areas in the Himalaya; In, Conservation and Management of Biological Resources in the Himalaya; PS Ramakrishnan, AN Purohit, KG Saxena, KS Rao and RK Maikhuri (Eds.); GB Pant Institute of Himalayan Environment and Development, Kosi-Katarmal, Almora and Oxford and IBH Publishing Co. Pvt. Ltd. New Delhi; pp 68-84.

Sardar, AK and SK Maity (1997) - Think forestry; In, The Hindustan Times; 25 February 1997.

Silori, CS and BK Mishra (1996) - Secondary impacts of developmental projects on the elephant corridors in Mudumalai wildlife sanctuary; Abstract published as Souvenir of National Seminar on Conservation of Endangered Species and Ecosystem: Protechnological and Ecological Approaches; Banaras Hindu University, Varanasi; 5-7 December 1996.

Sunderraj, SFW and AJT Johnsingh (1996) - Impact of flash flood on the gallery forest and arboreal mammals of river Servalar, Mundanthurai plateau, south India; Journal of Wildlife Resources; 89-94.

Sunderraj, SFW, BK Mishra and AJT Johnsingh (1995) - Elephant use of Rajaji-Corbett forest corridor, north-west India; In, A week with elephants; Proceedings of the International seminar on the Conservation of Asian Elephant held in Mudumalai Wildlife Sanctuary, South India, 13-15 June 1993; JC Daniel and Hemant S Datye (Eds.); Bombay Natural History Society; Oxford University Press, Oxford; pp 261-269.

Trivedi, P and AJT Johnsingh (1996) - Roost selection by Indian peafowl (*Pavo cristatus*) in Gir forest, India; Journal of Bombay Natural History Society; 93: 25-29

Williams, AC and AJT Johnsingh (1996) - Status survey of elephants and their habitats in Garo hills, north-east India; GAZAH; 16: 43-60.

Williams, AC and AJT Johnsingh (1996) - Threatened elephant corridors in Garo hills, north-east India; GAZAH; 16: 61-68.

Williams, AC and AJT Johnsingh (1996) - Elephant capture in Meghalaya, north-east India - The past and the future; GAZAH; 17: 1-7.

Reports

Bhatnagar, YV and S Sathyakumar (1997) - Developing a long term monitoring programme for birds and mammals in the Indian Ocean and Antarctica; Report on the XV Indian Scientific Expedition to Antarctica; Wildlife Institute of India, Dehra Dun; January 1997; pp 37.

Chowdhary S., et al (1996) - Management of elephants; Interim report on the West Bengal Forestry Project; Wildlife Institute of India, Dehra Dun.

Rajpurohit, KS and NPS Chauhan - Survey of animal damage problem in and around protected areas and managed forests: Phase-I Madhya Pradesh, Bihar and Orissa.

Ramesh, K and S Sathyakumar (1997) - Conservation status, distribution and relative abundance of ungulates in Great Himalayan national park; Interim report on FREE-GHNP Project; Wildlife Institute of India, Dehra Dun; February 1997; pp 49.

VB Sawarkar, SP Sinha, Bitapi Sinha and Rawat GS (1997) - Management of rhinoceros; Interim report on the West Bengal Forestry Project; Wildlife Institute of India, Dehra Dun.

Vinod, TR, SP Goyal and S Sathyakumar (1997) - Ecology of ungulates, bears and pheasants in Great Himalayan national park; Interim report on FREE-GHNP Project; Wildlife Institute of India, Dehra Dun.

Williams, AC and AJT Johnsingh (1996) - A status survey of elephant (*Elephas maximus*), their habitats and an assessment of elephant-human conflict in Garo hills, Meghalaya; Report

submitted to Meghalaya Forest Department and Government of India; Wildlife Institute of India, Dehra Dun, India; pp 27.

Presentations

Chauhan, NPS (1996) - Resolving human-large felids conflicts in and around protected areas in India; International Symposium on Wildlife Management, Utilisation and Trade; EcoWorld '96 Congress, Johannesburg, South Africa.

Kala, CP and GS Rawat (1996) - Conservation and management of alpine meadows: A case study from the Valley of Flowers national park; National Seminar on the Conservation of Endangered Species and Ecosystems; at Varanasi, 5-8 December 1996.

Karunakaran, PV, VK Uniyal and GS Rawat (1996) - Biodiversity of grasslands in the high ranges, Kerala; National Seminar on Biodiversity Conservation in High Ranges; at Munnar, Kerala; 1-2 October 1996.

Rawat, GS (1996) - Sacred plants of the Himalayan region and their conservation; National Seminar on Sacred groves of India - Their Biodiversity and Conservation; at Hyderabad; WWF-India (AP Branch); 21 April 1997.

Jhala, YV (1997) - Tigers in Panna: Their conservation prospects in semi-arid sub-optimal habitats in India; Tiger 2000 Conference; at London; Zoological Society of London. Feb 20-21, 1997.

Technical reports

Environmental impact assessment of proposed Oman-India gas pipeline project on wildlife values (1995); WII-EIA Technical Report 14.

An evaluation of the proposed nuclear power station site at Nagarjunasagar with special reference to its conservation value (1996); WII-EIA Technical Report 17; (1996).

Ecological assessment of proposed hydrotreatment plant at Bongaigaon; (1997); WII-EIA Technical Report 18.

Ecological impacts of lignite mining in Kutch with special emphasis on the Indian grey wolf and its habitats (1997); WII-EIA Technical Report 19.

MEMBERS

Training, Research & Academic Council (TRAC)

- | | | | |
|--|-----------------------------------|--|---------------------------------------|
| 1. Shri JC Daniel
16/186, Chander Niwas, Seon (East)
Mumbai - 400 022 | 4093295 | 10. Shri K Jagan Mohan Rao, IFS
CCF (WL) & Chief Wildlife Warden
Government of Andhra Pradesh,
Saifabad, Hyderabad - 500 004
(Andhra Pradesh) | 23056
232668 |
| 2. Dr Gnanaprakasam
Former Vice Chancellor
Tamil Nadu Veterinary &
Animal Sciences University,
Plot No. 436, Velanagam, C-Sector,
5th Street, Anna Nagar, West Extension
Chennai - 101 | 6266521
Fax 6215908 | 11. Shri ST Lachungpa, IFS
Addl. CCF & Chief
Wildlife Warden, Wildlife Circle
Government of Sikkim, Forest Secretariat
Deorali, Gangtok (Sikkim) | 22330
22213(R) |
| 3. Dr AR Rahmani, Chairman
Centre of Wildlife & Ornithology
Aligarh Muslim University, Aligarh (UP) | 401052
400759 | 12. Shri RG Soni, IFS
CCF & Chief Wildlife Warden
Government of Rajasthan
Van Bhavan, Vaniki Path
Jaipur - 302 005, (Rajasthan) | 380832
540531(R) |
| 4. Dr KC Malhotra
Indian Statistical Institute
Anthropometry & Human Genetics
Unit, 203, Barrackpur
Trunk Road, Calcutta (West Bengal). | 526694,8596,
5402,7694 | 13. Shri AK Sinha, IFS
Chief Wildlife Warden
Government of Mizoram
Aizawl, (Mizoram) | 2453 |
| 5. Dr R Sukumar
Centre for Ecological Sciences
Indian Institute of Science
Bangalore (Karnataka) | 3340985
3344411
Fax 3341683 | (Two special invitees alongwith 5 Chief Wildlife
Wardens) | |
| 6. Shri SC Dey
Addl. IG (Forests) &
Director, Wildlife Preservation
Ministry of Environment & Forests
Paryavaran Bhavan, B-Block
CGO Complex, Lodi Road
New Delhi - 110 003 | 436228
3011604(R) | 14. Dr VS Vijayan
Director
Salim Ali Centre for
Ornithology & Natural History
Kalamplayam PO, Coimbatore
(Tamil Nadu) | 807973
807952
FAX:807952 |
| 7. Dr Ashok Singh, IFS
CCF (WL) & Chief
Wildlife Warden
Govt. of Uttar Pradesh
17 Rana Pratap Marg, Lucknow (UP) | 283902
283 49(R) | 15. Dr PK Hazra
Director
Botanical Survey of India
P-8, Brabourne Road
Calcutta (West Bengal) | 2424922 |
| 8. The Administrator
Forest Department
Kawaratti, Lakshadweep | | 16. Dr JRB Alfred
Director
Zoological Survey of India
M-Block, New Alipore
Calcutta - 700 053 | 478689 |
| 9. Shri Anil Mishra, DCF
Admn of Dadar & Nagar Haveli
Forest Department
Silvasa - 396 230
(Dadar & Nagar Haveli) | 2666
2010(R)
FAX:02639-2734 | 17. Shri SC Sharma
Member-Secretary
Central Zoo Authority
Bikaner House
Annexe IV, Shahjahan Road
New Delhi - 110 011 | 3381585
6917139 (R)
Fax 3386012 |

18. Shri PB Gangopadhyay, IFS
Head Silviculture Division
Indian Council of Forestry
Research and Education
PO New Forest, Dehra Dun
19. Dr AJT Johnsingh
Head, Wildlife Biology Faculty
Wildlife Institute of India
Dehra Dun
20. Shri VB Sawarkar
Head, Wildlife Management Faculty
Wildlife Institute of India
Dehra Dun

627579

21. Shri Ujjwal Bhattacharya
Head, Wildlife Extension Faculty
Dehra Dun
22. Dr Ravi Chellam
Research Coordinator
Wildlife Institute of India
Dehra Dun
23. Shri SK Mukherjee
Director
Wildlife Institute of India
Dehra Dun

Members of Governing Body

- | | | | |
|--|---------------|--|------------------|
| 1. Shri Vishwanath Anand, IAS
Secretary to the Govt. of India
Ministry of Environment & Forests
Paryavaran Bhavan, B-Block
CGO Complex, Lodi Road
New Delhi - 110 003 | Chairman | 8. Shri PK Brahma
Joint Secretary (Finance)
Ministry of Environment & Forests
Paryavaran Bhavan, B-Block
CGO Complex, Lodi Road
New Delhi - 110 003 | Member |
| 2. Shri CP Oberoi, IFS
Inspector General of Forests
Ministry of Environment & Forests
Paryavaran Bhavan, B-Block
CGO Complex, Lodi Road
New Delhi - 110 003 | Vice Chairman | 9. Dr BN Gupta
Director General
Indian Council of Forestry
Research & Education
New Forest, Dehra Dun - 248 006 | Member |
| 3. Shri SC Dey, IFS
Addl. IG (Forests) & Director Wildlife
Preservation,
Ministry of Environment & Forests
Paryavaran Bhavan, B-Block
CGO Complex, Lodi Road
New Delhi - 110 003 | Member | 10. Dr PHS Rao
Joint Educational Adviser (G)
Department of Education
Ministry of Human Resource Development
Shastri Bhavan, New Delhi - 110 001 | Member |
| 4. Shri S Deb Roy
A/16, Shalimar Apartment,
South Ex. Plaza II, 209 Masjid Moth,
NEW DELHI-110 049 | Member | 11. Dr Ashok Singh, IFS
Chief Wildlife Warden
(Representative of Chief Secretary,
Govt. of UP)
17 Rana Pratap Marg
Lucknow - 226 001 | Member |
| 5. Shri Shivbhadra Sinhji
'Bhavvilas'
Near Gaurishankar Lake
Bhavnagar - 364 003, (Gujarat) | Member | 12. Shri BC Choudhury
Scientist-SE
Wildlife Institute of India
Post Box 18, Chandrabani
Dehra Dun - 248 001 | Member |
| 6. Dr. Ishwar Dass
E-1/154, ARERA Colony
Bhopal - 462 016, (Madhya Pradesh) | Member | 13. Shri SK Mukherjee
Director
Wildlife Institute of India
Post Box 18, Chandrabani
Dehra Dun - 248 001 | Member Secretary |
| 7. Shri Ashish Chandola
H-6B, Hauz Khas
New Delhi - 110 016 | Member | | |

AUDIT CERTIFICATE

I have examined the Receipts and Payments Account, Income and Expenditure Account for the year ended 31st March 1997 and the Balance Sheet as on 31st March 1997 of the Wildlife Institute of India, Dehradun.

I have obtained all the information and explanations that I have required and, subject to the observations in the appended Audit Report, I certify, as a result of my audit, that in my opinion these accounts and balance sheet are properly drawn up so as to exhibit a true and fair view of the state of affairs of the Wildlife Institute of India according to the best of information and explanations given to me and as shown by the books of the organisation



Principal Director of Audit

New Delhi

Dated : 19 - Sept - 1997

WILDLIFE INSTITUTE OF INDIA

Income and Expenditure account for the year ending 31st March, 1997

EXPENDITURE		INCOME	
To salaries and allowances	1,04,52,132.00	By Grant-in-aid	4,40,00,000.00
To leave salary & pension Contribution	64,951.00	Deptt. of Environment & Forests & Wildlife, N. Delhi	
To bonus	2,00,044.00	Less transfer to Capital expenditure	(-),82,37,094.00] 2,57,62,906.00
To honorarium	87,867.00	By training cost	13,42,263.00
To fellowship	9,73,253.00	Other receipts (Training)	14,740.00
To wages	8,72,761.00		
To travel expenses	22,90,262.00		
To newspapers & magazines	29,341.00		
To publicity and advertisement	62,192.00	By interest on training account	29,745.00
To operational expenses	24,14,951.00	By Interest on bank deposits	4,06,542.00
To stationery	5,97,635.00		
To rent for hired buildings	30,232.00		
To postage and telegram	1,18,377.00		
To sports goods	1,07,019.00	By penal interest	191.00
To telephone & trunk calls	14,47,692.60	By miscellaneous receipts	7,90,738.00
To conveyance	10,800.00		
To electricity & water charges	10,26,211.14	By training cost accrued but not received	4,76,575.00
To printing & binding	3,16,259.00	By WII receipts (Institutional charges)	8,11,531.00
To repair & maintenance of office equipment	31,489.00	By M.Sc. Course Fees	8,73,180.00
To Govt. contribution to pension fund	6,56,670.00		
To LTC	1,12,159.00	By CZA Workshop	66,455.00
To insurance (Research Fellow & Faculty members)	16,851.00		
		CONSULTANCY PROJECT	
To stipend	1,42,320.00		
To over time allowance	2,43,259.00	Receipt during the year	73,39,309.00
To legal expenses	2,47,543.00		
To training cost	16,42,829.51		
To repair & maintenance of vehicles	6,86,595.00		
To POL for vehicles	9,15,426.00		
To lab chemicals	29,885.00		
To estate maintenance	12,22,777.00		
To land scaping	5,16,930.00		
To publication	3,12,089.00		
To uniform	15,289.00		
To ERMN	24,91,316.00		
WII Sales Tax	2,32,786.00		
Consultancy project expenditure	50,68,975.00		
Excess of income over expenditure	22,27,006.75		
TOTAL	3,79,14,175.00		3,79,14,175.00

sd/-
(S.S. Oberoi)
Finance Officer

sd/-
(Dr. S.P. Singh)
Registrar

sd/-
(S.K. Mukherjee)
Director

WILDLIFE INSTITUTE OF INDIA
BALANCE SHEET AS ON 31st MARCH, 1997

FUNDS & LIABILITIES			ASSETS		
	AS ON 31/3/97	ADDITION DURING 1996-97	AS ON 31/3/97	ADDITION DURING 1996-97	AS ON 31/3/97
	Amount (Rs. Ps.)	Amount (Rs. Ps.)	Amount (Rs. Ps.)	Amount (Rs. Ps.)	Amount (Rs. Ps.)
Excess of income over expenditure	1,70,07,071.93	22,27,006.75	1,92,34,078.68		
Pension fund	20,71,828.00	11,13,037.25	31,84,865.25		
G.P. Fund	37,32,924.03	6,22,373.00	43,55,297.03		
Amount capitalised	16,64,50,919.03	1,82,37,094.00	18,46,88,013.03		
CGEGIS refund	69,556.90	(-) 53,133.00	16,423.90		
Income tax salary	7,900.00	(-) 7900.00	—		
Earnest Money Deposits (EMD)	—	53,600.00	53,600.00		
Sales tax from contractor	40,661.00	(-) 40,661.00	—		
Income tax from contractors	30,148.99	(-) 30,148.99	—		
Security deposit	13,50,509.95	(-) 3,56,945.00	9,93,564.95		
Withheld amount	2,31,793.00	2,09,680.00	22,113.00		
Security deposit (Hostel)	2,500.00	(-) 2,500.00	—		
PLI premium	19.00	(-) 19.00	—		
Publication of book	2,05,000.00	(-) 2,05,000.00	—		
for Central Zoo Authority					
			Land	66,07,214.65	66,07,214.65
			Trees	24,32,709.00	24,32,709.00
			Avenue Plantation	23,34,576.15	19,774.00
			Campus Development	29,33,077.31	5,74,289.00
					35,07,366.31
			Lab Equipment	12,61,474.07	255.00
			Furniture and Fixture	69,29,577.69	9,10,175.00
			Vehicles	51,94,690.21	—
			Library books	64,46,144.28	13,59,051.00
			Office equipment	30,19,180.90	5,94,332.00
			Camp equipment	4,95,237.34	30,892.00
			Photographs & photos	10,56,958.20	1,48,504.00
			Material & supplies	38,63,727.95	—
			Educational Films	10,71,382.35	9,050.00
			Journals & periodicals	73,11,807.00	25,15,631.00
			Training equipment	1,38,05,892.24	31,02,607.00
			Boundry wall	14,46,200.59	—
			- Block I & Gate		14,46,200.59
			Boundry Fencing	8,17,934.93	—
			Building complex	8,43,61,847.00	78,64,421.00
					9,22,26,268.00
			Architectural & supervision fee	51,13,253.85	6,70,180.00
			D.G. Set	7,15,126.00	—
			EPBAX	11,76,484.00	—
			AC Plant	25,97,452.00	—
			Advance for expenses for training	28,584.00	(-)28,584.00
					(+)45,830.00
			Advance to staff	8,41,795.00	94,136.21
			Loan & advances to staff	12,09,369.20	1,86,715.00
			Staff quarters	31,75,520.00	—
					31,75,520.00

Contd. Next Page

GP Fund remittance due (for expenses)	1,382.00	(-) 1,382.00	—	Road and culverts	8,96,007.00	4,37,963.00	13,33,970.00
Receipts from Rajaji NP for Elephant Action	75,000.00	56,207.00	18,793.00				
Plan Workshop held in June '96							
Payment received for research equipment for Siberian Crane Project	—	2,03,000.00	2,03,000.00				
Project cost (Shri Pratap Singh)	—	88,590.30	88,590.30				
Training cost (Sri Lanka)		1,90,250.00	1,90,250.00				
Double payment to be refunded							
				Tennis courts	5,30,852.32	—	5,30,852.32
				Auditorium	8,56,592.00	—	8,56,592.00
				To closing stock of steel, cement and wood	11,22,421.90	(+)71,780.00	10,93,059.90
						(-)1,01,142.00	
				Grant-in-aid accrued but not received	35,00,000.00	(-)35,00,000.00	—
							8,48,281.90
				Closing bank balance (Training account)			1,36,77,204.92
				Closing bank balance			1,28,382.70
				Closing cash balance			
				<u>GP Fund</u>			3,55,297.03
				Bank Balance			30,00,000.00
				Kisan Vikas Patra			10,00,000.00
				F.D.R.			
				<u>Pension Fund</u>			3,34,865.25
				Bank balance			14,50,000.00
				Kisan Vikas Patra			14,00,000.00
				F.D.R.			7,98,735.00
				Training cost accrued but not received	9,93,540.00	(-)6,71,380.00	
						(+)4,76,575.00	
				Consultancy Project (B)			22,70,334.00
				Closing Balance			
							21,30,48,589.14
GRAND TOTAL	21,30,48,589.14			GRAND TOTAL			21,30,48,589.14

The above balance sheet to the best of our belief contains a true account of the Funds, Liabilities, Property and Assets of the Institute.

sd/-
(S.S. Oberoi)
Finance Officer

sd/
(Dr. S.P. Singh)
Registrar

sd/-
(S.K. Mukherjee)
Director

RECEIPTS AND PAYMENTS ACCOUNT FOR THE YEAR ENDING 31st MARCH, 1997

RECEIPTS	PAYMENTS	PLAN	NON PLAN	TOTAL
To opening balance:	By Salaries	6508132.00	3944000.00	10452132.00
Cash in Hand 90741.70	By Leave salary and pension Contribution		64951.00	64951.00
Cash in Bank 10784861.56	By Bonus	100044.00	100000.00	200044.00
Balance in Bank (Training Account) 450229.41	By Honorarium	50000.00	37867.00	87867.00
	By Fellowship			973253.00
To Grant-in-aid 47500000.00	By Wages	772761.00	100000.00	872761.00
Department of Environment and Forests, New Delhi	By Travel Expenses			2290262.00
To Training Cost	By Newspapers and Magazines			29341.00
Training Cost received during the year 1342263.00	By Publicity and Advertisement			62192.00
	By Rajaji National Park Workshop			56207.00
Outstanding Training Cost received during the year 671380.00	By Operational expenses	904900.00	1510051.00	2414951.00
	By CZA Publication Amount adjustment			205000.00
Other Receipts 14740.00	By CZA Workshop Expenditure			388500.00
	By Stationery	300000.00	297635.00	597635.00
Outstanding advance for expenses received 28584.00	By Overtime Allowance	140259.00	103000.00	243259.00
Interest from Bank account (Training) 29745.00	By Rent for hired building		30232.00	30232.00
	By Postage and Telegram	80377.00	38000.00	118377.00
	By Sports goods		107019.00	107019.00
To interest credited by Bank 406542.00	By Telephone and Trunk Calls	847692.60	600000.00	1447692.60
To Penal Interest 191.00	By Conveyance Charges	10800.00		10800.00
To recoveries on account of Cement and Steel 101142.00	By Electricity and Water Charges	526211.14	500000.00	1026211.14
Training Cost (Sri Lanka) Double payment (To be refunded) 190250.00	By Printing and Binding	180259.00	136000.00	316259.00
To GPF	By Repair of Office Equipments	31489.00		31489.00
	By LTC		112159.00	112159.00
Opening Balance 7,32,924.03	By Refund of Withheld amount from contractor's bills	209680.00		209680.00
Kisan Vikas Patra 30,00,000.00	By Refund of Security Deposits Contract	356945.00		356945.00
Receipt during the year 6,22,373.00				
To Pension Fund				
Opening Balance 6,21,828.00	By Refund of Security Deposit (Hostel)			2500.00
Kisan Vikas Patra 14,50,000.00	Uniform		15289.00	15289.00
Receipt during the year 11,13,037.25	By Refund of PLI Premium			19.00
WII Receipts (Institutional charges)				
i) Garo Hills 1,00,000.00	By Insurance of Research Fellows & Faculty Members	16851.00		16851.00
ii) IUCN Study Tour 34,910.00	By ERMN	2491316.00		2491316.00
iii) Training A/c 2 70,600.00				
iv) INDO-USFWS Project+A16 1,02,285.00				
1,98,132.00				
v) Wolf Project USFWS 3,05,604.00				
To Loans & Advances (staff)				
House Building Advance 1,07,520.00	By Landscaping	516930.00		516930.00
Scooter Advance 11,099.00	By Stipend to M.Sc. students	142320.00		142320.00
Cycle Advance 1,100.00				
Computer Advance 16,728.00	By Legal Expenses	147543.00	100000.00	247543.00
Festival Advance 1,940.00				
Car Advance 48,328.00	By Publication	312089.00		312089.00
M.Sc. Course Fee 873180.00	By C.G.E.G.I.S. Final Payment			53133.00
to EMD 53600.00	By Training Cost on Course			1642829.51
	By Govt. Contribution to Pension Fund			656670.00

Contd. Next Page

RECEIPTS	PAYMENTS	PLAN	NON PLAN	TOTAL
To Misellaneous Receipts	By Repair & Maintenance of Vehicle		686595.00	686595.00
i) Sale of Tender Document 15,500.00	By POL for Vehicles	300426.00	615000.00	915426.00
ii) Guest House charges 97,953.00	By Laboratory Chemicals	29885.00		29885.00
iii) Recovery of loss 900.00	By Estate Maintenance	1222777.00		1222777.00
iv) H.L. Fee 1,12,362.00	By Sale Tax on WII Purchases			232786.00
v) Seminar & Workshop 5,47,747.00	By Income Tax from Contractors			30148.99
vi) Compensation of extension of time (const.) 2,989.00				
vii) Fine levied (Constr.) 150.00	By Sales Tax from Contractors			40661.00
viii) Interest received from staff 13,137.00	By G.P.F. Year 95-96			1382.00
To Central Zoo Authority 454955.00				7900.00
To payment received for research equipment 203000.00	By Income Tax from Salary			45830.00
for Siberian Crane project 88590.30	By Advance for Expenses (Training)	94136.21		94136.21
To project cost (OBC)	By Advance for Expenses (staff)	71780.00		71780.00
	By Cement	19774.00		19774.00
	By Avenue Plantation	910175.00		910175.00
	By Furniture & Fixture	225.00		225.00
	By Lab. Equipment	594332.00		594332.00
	By Office Equipment	3102607.00		3102607.00
	By Audiovisual & Training Equipment	30892.00		30892.00
	By Camp Equipment	148504.00		148504.00
	By Photographs & Photographic Equipments	1359051.00		1359051.00
	By Library Books	2515631.00		2515631.00
	By Journals & Periodicals	574289.00		574289.00
	By Campus Development	7864421.00		7864421.00
	By Construction of Buildings	670180.00		670180.00
	By Architectural & Management Fees	437963.00		437963.00
	By Roads & Culverts	9050.00		9050.00
	By Educational Films			
	Closing Balance			128382.70
	By cash in hand			13677204.95
Consultancy Project A/c	By bank balance with UBI	1152495.50		848281.90
Opening Balance 6186813.50	By cash with UBI (Trainees Account)			
Receipt during the year	GP fund			355297.00
	Bank balance			3600000.00
	Kisan Vikas Patra			1000000.00
	FDR			
	Pension Fund			334865.20
	Bank Balance			1450000.00
	Kisan Vikas Patra			1400000.00
	FDR			5068975.50
	Consultancy Project Exp.			2270334.00
	Closing Balance			
Total 79952450.25		34602696.95	9097798.00	79952450.25

sd/-
(S.S. Oberoi)
Finance Officer

sd/-
(Dr. S.P. Singh)
Registrar

sd/-
(S.K. Mukherjee)
Director

PERMANENT ASSESTS AS ON 31.3.1997

S. No.	Particulars	Opening Stock	Addition during the year	Total
1.	Land	66,07,214.65	-	66,07,214.65
2.	Trees	24,32,709.00	-	24,32,709.00
3.	Avenue Plantation	23,34,576.15	19,774.00	23,54,350.15
4.	Furniture & Fixture	69,29,577.69	9,10,175.00	78,39,752.69
5.	Lab Equipment	12,61,474.07	225.00	12,61,699.07
6.	Office Equipment	30,19,180.90	5,94,332.00	36,13,512.90
7.	Training Equipment	1,38,05,892.24	31,02,607.00	1,69,08,499.24
8.	Camp Equipment	4,95,237.34	30,892.00	5,26,129.34
9.	Photographs & Photo-graphic material	10,56,958.20	1,48,504.00	12,05,462.20
10.	Educational films	10,71,382.35	9,050.00	10,80,432.35
11.	Library Books	64,46,144.28	13,59,051.00	78,05,195.28
12.	Journals & Periodicals	73,11,807.00	25,15,631.00	98,27,438.00
13.	Materials & supply	38,63,727.95	-	38,63,727.95
14.	Vehicles	51,94,690.21	-	51,94,690.21
15.	Campus development	29,33,077.31	5,74,289.00	35,07,366.31
16.	Boundary Wall Block I	14,46,200.59	-	14,46,200.59
17.	Boundary fencing 1 & 3	8,17,934.93	-	8,17,934.93
18.	Construction of Bldg	8,43,61,847.00	78,64,421.00	9,22,26,268.00
19.	Architectural fee, Supervision & Completion	51,13,253.85	6,70,180.00	57,83,433.85
20.	D.G. Set	7,15,126.00	-	7,15,126.00
21.	E.P.A.B.X.	11,76,484.00	-	11,76,484.00
22.	Air Conditioner	25,97,452.00	-	25,97,452.00
23.	Staff Quarters	31,75,520.00	-	31,75,520.00
24.	Road & Culverts	8,96,007.00	4,37,963.00	13,33,977.00
25.	Tennis Court	5,30,852.32	-	13,33,977.00
26.	Auditorium	8,56,592.00	-	8,56,592.00
Total		16,64,50,919.03	1,82,37,094.00	18,46,88,013.03