ANNUAL REPORT

1995-96

भारतीय वन्यजीव संस्थान
Wildlife Institute of India

CONTENTS

DIRECTOR'S NOTE

WII is both the research arm of the Ministry of Environment and Forests and the only training institute of its kind where government and other sponsored officers come for training in protected area management and other aspects related to nature conservation. We are thus in a uniquely fortunate position of being able to provide a scientific understanding for better management decisions and at the same time are part of the academic tradition in the country.

During the year, we were called upon to provide scientific input for GEF-India Eco-development Project and FREEP Project of the Government of India which was started with assistance from the World Bank. Andhra Pradesh, Madhya Pradesh, West Bengal and Maharashtra governments also relied on us to give scientific input into their externally aided programmes. Although the institute is understaffed and our additional requirements against scientific posts as outlined in our EFC memo has not yet been sanctioned, which put us at a little disadvantage position, the commitment and dedication of the faculty and staff gave strength to take up these challenging assignments without compromising on our ongoing training and research activities. Moreover, we also conducted a Special Diploma Course for 20 PA Managers from Sri Lanka, which was well received by FAO/ UNDP which supported this programme under GEF for Sri Lanka.

The IDF grant of World Bank for ERMN which would have helped WII-National Wildlife Database and networking of institutions and PAs could not be fully utilized for want of procedural details and late approval of EFC Memorandum.

The significant development this year was getting approval of the Government of India to take up the second phase of the collaborative programme with US-Fish and Wildlife Service and US-Forest Service under Indo-US subcommissions in science and technology. This year again WII was represented in the Indian scientific expedition to Antarctica.

Our partnership and collaborative efforts with state organisations, universities and institutions and the transparency in our approach have helped us give desired results and meet our various objectives. WII's accomplishments are a reflection of the dedication of its faculty and staff and a deep desire to make a difference.

(SK Mukherjee)

YEAR AT A GLANCE

With environmental concern becoming more acute with the passing of each year, the role of organizations like Wildlife Institute of India (WII) is becoming ever more recognizable but at the same time more demanding. WII too, growing over the years, has learnt from its experiences and kept its tasks and programmes up to date and in tune with the realities in the field.

The year 1995-96 has been marked with achievements made in diverse fields and several major changes effected in institutional programmes. The importance and validity of the institute's regular training courses for the south Asian region is now unquestioned and reflected in the regular nomination and participation of overseas forest personnel in them. In fact, this year, WII conducted an entire Special Diploma course for wildlife rangers of Sri Lanka. This was the first of two such long-term courses approved by the Government of India, funded by the GEF/FAO Project of the Department of Wildlife Conservation (DWLC), Sri Lanka. The curriculum for the course was developed in consultation with Sh HS Panwar, the ex-Director of WII, who is now Senior FAO Advisor to DWLC, Sri Lanka. Part of the course (six months) was held in Sri Lanka for which four assigned faculty members from WII went there, while for the remaining three months, the Sri Lankan officer trainees were imparted training at WII.

A significant change made this year was in the format of the Diploma course. The course had been designed in the mid-eighties when environmental and wildlife issues vis-a-vis the forest service were not so well etched out, and WII itself then was a fledgling institution. Over the years, as has happened in every field, environmental issues and concepts have changed or grown and so too have the methodologies to meet the fresh concerns. The diploma course required to be remodelled. It became necessary that the course format be redesigned if it was meant to be relevant and closer to the present day field realities.

The course's earlier two-term format with inputs from the institute's three faculty divisions culminating in a management plan writing exercise was changed and replaced by a modular format. With sixteen specific modules, the course is now definitely more interactive, generates a much wider and more intense involvement of WII faculty and staff on the one hand and the trainees on the other, and includes more relevant subjects and topics in their due importance. Ecodevelopment Planning and Wildlife Management Planning courses, which the state forest departments considered important but could not send enough candidates for, have now been placed in the new Diploma course as distinct modules. The course, as such, now allows "lateral entrants", should there be participants opting for only such selected modules. The flexibility of the new format also makes it much more amenable to any future changes and additions.

On the other fronts, the Ecodevelopment Planning and Wildlife Management Planning courses held hitherto, have resulted in some valuable planning exercises in various PAs, and initial draft plans from seven of the assigned sites have already been received.

WII is one of the very few institutions offering a master's course in wildlife science, seeking to train fresh students into trained wildlife biologists and scientists for wildlife conservation. This year, the institute completed its fourth M.Sc course in wildlife science, and started on the fifth batch, selecting students after a competitive national entrance test.

Other than its regular training courses, the institute also organized several important workshops and seminars. It's

own research seminar has become an important annual gathering for deliberating on wildlife research in the country and communicating the institute's various studies before an invited audience of eminent foresters, wildlife scientists, academicians and conservationists. The highlight of this year's research seminar was the inclusion of, for the first time, presentations by M.Sc. students on the Master's dissertation work.

For WII, research is one of its primary objectives. It is being carried out on the ecological, biological, behavioral aspects of big and small, rare and endangered faunal and floral species including their people related interface issues, with the application of GIS becoming more and more important and evident. In 1995-96, four research studies got completed and eighteen new ones were initiated. In order to meet this growing list of study projects, 22 junior research fellows and 3 research associates were recruited during the year. The institute's flag continued to fly in Antarctica with its continued participation in the Indian scientific expedition there. The research study on developing a long-term monitoring programme for wildlife in Antarctica, which was initiated last year when WII participated in the expedition for the first time, was carried forward this year. The institute would continue to participate in the forthcoming expeditions to the icy continent, in order to continue with the monitoring programme.

Consultancies for the EIA are being offered to WII regularly by various agencies. This year, WII also did two major consultancies - for West Bengal and Andhra Pradesh forest departments, providing scientific inputs into their World Bank aided projects. For West Bengal, WII's assistance was sought to develop approaches for the management of elephant populations. In the case of Andhra Pradesh, WII was consulted for the preparation of integrated protected area system.

Since the institute's very inception, international organizations such as UNDP, FAO, FWS (US) have helped or collaborated with WII, first to help it get established and then to become professionally sound and developed. While the first phase of Indo-US project on "Development of WII" was completed last year, a second phase of taking up specific projects to reinforce and implement the technical gains made in the first phase, has now been cleared by the government of India.

Among the various services and facilities at WII, its library is a major resource information centre. It houses over 17,000 titles besides over 6500 reprints and 7000 topographic maps. Some of its services are available to outsiders too, on payment. The laboratory assists the various research studies of the institute as well as external judicial and crime detection agencies for identification of confiscated wildlife products. Toward this goal a project has been started this year, in collaboration with FWS, on establishing wildlife forensic capacity at the WII laboratory.

The institute's nine-projector slide programme "We are Nature; Nature is our World" is a major production that has received much kudos from all quarters. It is shown on important occasions and to august gatherings. Hitherto, the programme was run with the assistance of professionals. However, the staff of the AV unit has got trained in its operation and are able to run the entire show on its own. This has not only effected considerable savings but also allows a more frequent projection of the programme.

On the campus development front, much of Phase II construction work has been completed. A new hostel and more faculty and staff houses have come up.

Overall, the year 1995-96 has been busy as always, with WII making yet further gains and advancement.

Main Programme 1995-96

Regular training courses

1. XVI PG Diploma Course (9 months)
2. XVII PG Diploma Course (9 months)
3. IV M.Sc. in Wildlife (2 years)
4. V M.Sc. in Wildlife (2 years)
5. Certificate Course (3 months)

Short Courses, Workshops, Seminars

6. Annual Research Seminar
7. Capsule Course for IFS Officers (3 weeks)
8. Interpretation & Conservation Education (10 days)
9. Endangered Species and Zoo Management
10. Computer training - Diploma trainees
11. Workshop on "Research on Conservation of Biodiversity"
12. Workshop on PHVA for Barasingha
13. Workshop on IPAS for World Bank Aided AP Forestry Project
14. Workshop on Environmental Resource Management Network
15. Workshop for Senior Army Officers on "Environment and Nature Conservation"
16. Workshop on "Control of Illegal Wildlife Trade in India"

Consultancies- World Bank State Forestry Projects

17. Elephant Management - West Bengal
18. IPAS in Andhra Pradesh
19. GEF Ecodevelopment Project

Campus development

1. Construction on New Hostel Block
2. Residential Units (Type 1-V)
3. Earthen Dam

Publications

1. Information Brochure on Courses at WII
2. Annual Report 1994-95
3. Pheasants of India and their aviculture
4. Proceeding of Buffer Zone Management Workshop
5. Impact of Management Practices on Lion and Ungulates Habitats in Gir Protected Area
6. A Manual for Planning Management in PAs and Managed Forests

S. Sathyakumar

Caltha palustris, one of the first sign of life after melting snow in Kedarnath Wildlife Sanctuary

BACKGROUND

India is among the few mega-diversity countries in the world, with its biodiversity unique in terms of both species richness as well as the range of its habitats from cold deserts to tropical rainforests. But since the last half a century or so, mainly due to the immense human and livestock population increase and a lopsided distributive development pattern in which wilderness areas like forests, grasslands, deserts, mountains and coasts have effectively got marginalised or unjustly exploited, the country's biodiversity is getting considerably eroded. How can this downward slide be checked and reversed, is a question now being asked from all important forums.

Protecting wilderness areas is one of the most effective ways of conserving the country's biodiversity, but considering the little success of the early protective measures in this field, the management of protected wilderness areas desires much to be achieved. The forest departments being custodians of the protected areas have lately diverted their attention from purely industrial and economic potential of such areas to their ecological roles which is in accordance with the current forest policy.

Under such prevailing situation, there was the need of an agency which would look at forests holistically and effectively, and combine forest management with conserving the biodiversity therein. Wilderness area or wildlife management and conservation called for a scientific yet practical approach. Management of protected areas needed to be carefully and rigorously planned and executed for besides conserving the biological diversity, it was to simultaneously ensure sustainable productivity and secure human life-support systems, particularly in areas adjoining the protected areas.

Such a need led to the evolution of Wildlife Institute of India (WII) at Dehra Dun in 1982 with a mandate to :

* Orient and train personnel at various levels in the conservation and management of wildlife resources;

* Carry out research relevant to management, develop techniques relevant to Indian conditions and build up a body of scientific knowledge on Indian wildlife;

* Cooperate with national and international sister organizations and provide advice on specific wildlife management problems; and

* Grow into an autonomous institution of university status nurturing graduates in natural resource conservation and management, and ultimately become a regional centre of international importance in studies of Asian wildlife and natural resource management.

For WII, the mandate was a two-pronged challenge. The guardians of the forests in India, the foresters, were basically trained in forestry and not in wildlife management which called for their orientation to wildlife. But, with wildlife not yet being a discipline of any significance in the university education curriculum, there were no clear directions available for teaching it. As such, WII had to not only give forest management a wildlife slant, but also create and develop the very resources with which it could go about its tasks.

This apparent disadvantage with which WII started, ultimately became the source of its major strength as it not only provided the institute with a strong foundation but also prevented its programmes from becoming mere academic exercises. WII's programmes are field based and seek an integration of biological, managerial, socio-economic and human aspects of large regional landscapes. Wildlife

conservation for WII does not just mean providing protection mainly to a few species but that it be holistic and have considerations for humans living in the vicinity as well.

WII's research 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. This ensures that the teaching always remain updated and relevant to field conditions and actual requirements.

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. It was accorded an autonomous status in April 1986. Today, it offers a wide range of programmes - diploma and certificates courses for foresters, short term courses for personnel from various services and jobs, training workshops and seminars, and a post-graduate degree in wildlife science affiliated to the Saurashtra University, Gujarat. The institute works in close collaboration with wildlife organizations, scientific institutions and universities at national and international levels. With such collaborations continuing and the fact that many of the 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 computerised analytical techniques; and

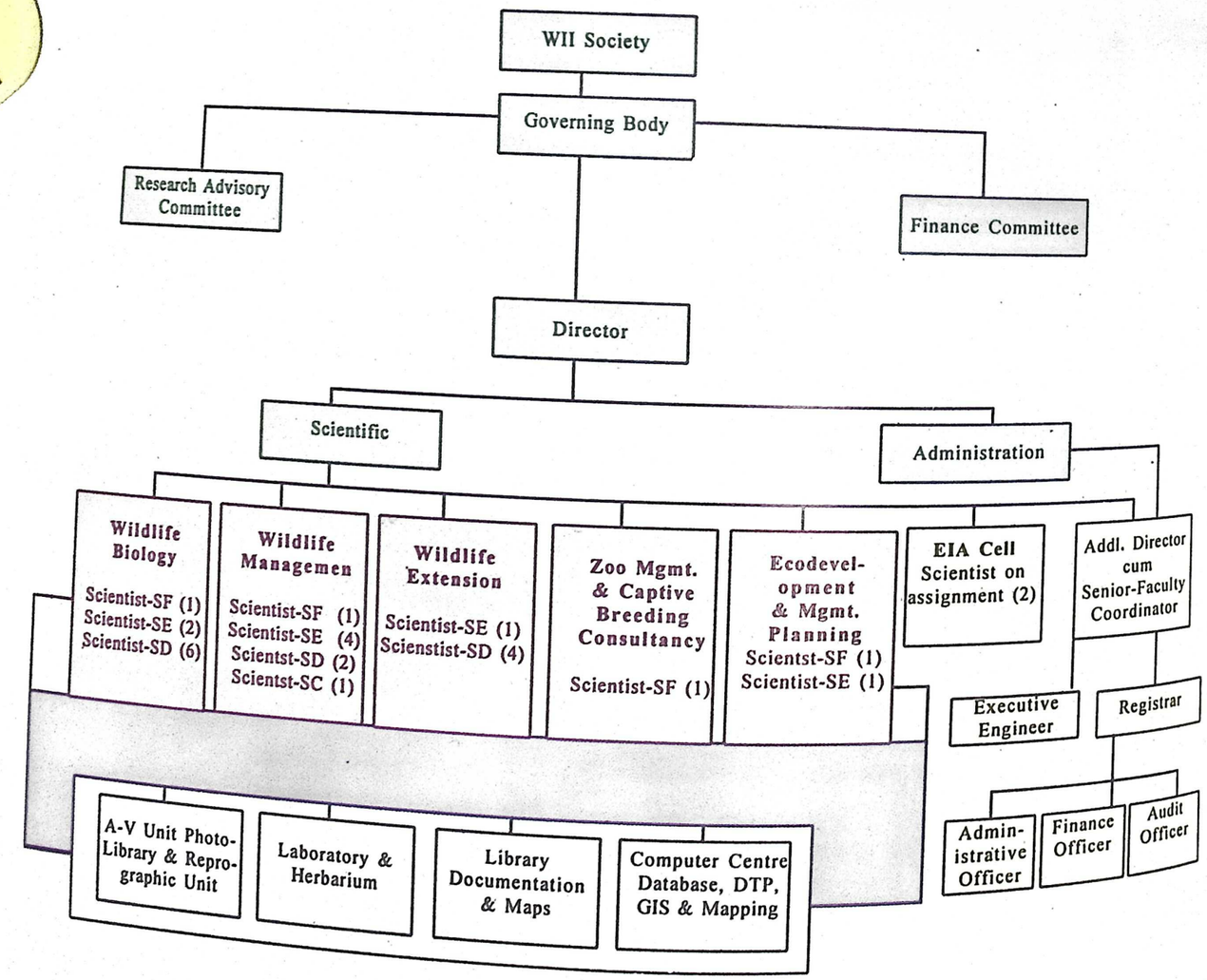
* Provide advisory and consultancy services to central and state governments, universities, research institutions and other official and non-official agencies.

INSTITUTIONAL INFRASTRUCTURE

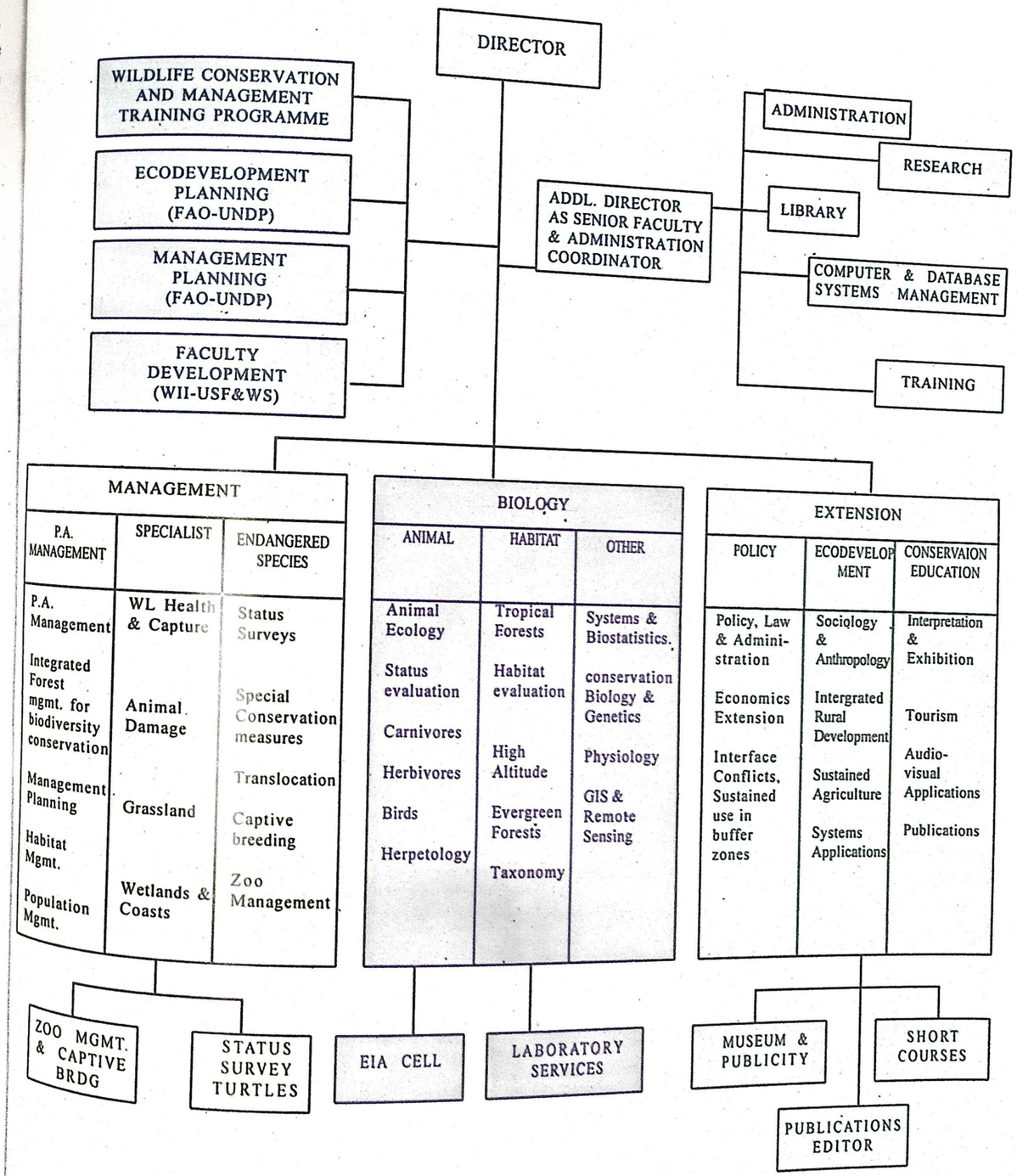
There are three faculty divisions in WII - Biology, Management and Extension, besides an Ecodevelopment cell handling programmes in "Ecodevelopment and management planning", and handling of internationally aided projects, and an EIA cell which undertakes consultancies in mandatory preview of the impact of proposed industrial or other developmental projects on forests and wildlife. The *library and documentation centre, laboratory, computer cell* and *audio-visual unit* support the institute's various scientific and academic functions. The charts below reflect WII's organizational structure.

The following is an account of WII's programme and activities during the year 1995-96.

ORGANIZATIONAL STRUCTURE - ADMINISTRATIVE



ORGANISATIONAL STRUCTURE - SCIENTIFIC



ACADEMIC

TRAINING PROGRAMMES

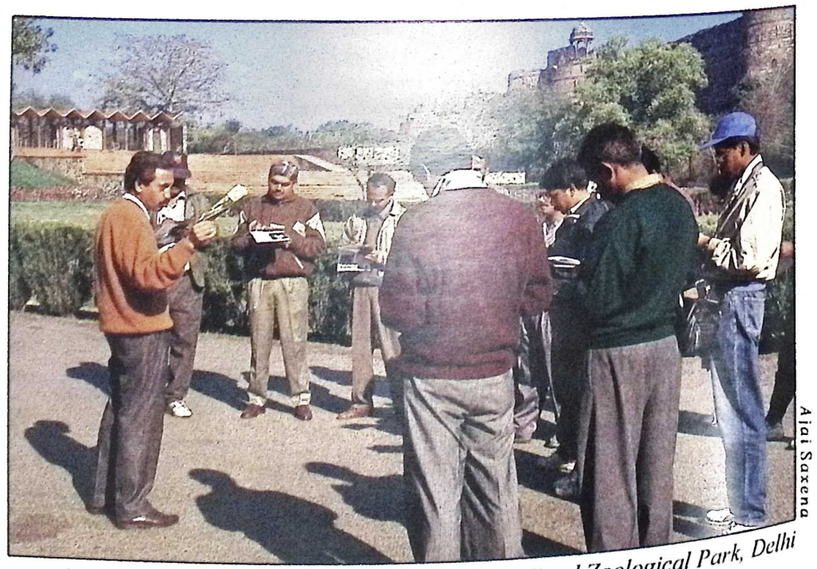
Post-Graduate Diploma Course in Wildlife Management : The XVI Diploma Course was reported in detail in the previous Annual Report. During the year under reporting, the trainees underwent the following : (1) Techniques Tour II, 5-10 April 1995, to Kedarnath wildlife sanctuary (Uttar Pradesh) where they carried out exercises relating to high altitude flora and fauna, besides a visit to the Musk Deer Breeding Centre at Kanchula Kharak; (2) Management Plan Tour, 15 April-5 May 1995 to Tadoba tiger reserve (Maharashtra), where trainees were tested in the preparation of Management Plan for the reserve, as part of their final evaluation.

The course concluded on 31 May 1995. The top honours and institute gold medal went to BP Acharya from Orissa. Other awards for excellent performance were given to CK Patil (Madhya Pradesh), Siddhartha Roy (West Bengal), MG Jayathangaraj (Tamil Nadu), Manoj Mahapatra (Orissa) and PFU Pathmasiri (Sri Lanka).

The Diploma course has been WII's premier training programme since its very inception. However, in the last decade the conservation scenario has rapidly changed, the issues have grown manifold, new concepts and approaches have developed, and the requirements of the major user agency, i.e. State Forest Departments too have changed. As such, this training programme, designed in the mid-eighties required some restructuring.

At the same time, some lacunae had surfaced in some of institute's medium-term courses, e.g. the three-month courses on "Ecodevelopment Planning" and "Management Planning". Despite the relevance of these courses acknowledged by the States, many could not nominate suitable officers.

Accordingly, the Diploma course, so far divided into two terms with training inputs from three major faculty disciplines i.e. Wildlife Biology, Wildlife Extension and Wildlife Management, culminating in a Management Plan writing exercise, was refashioned into a new and modular form comprising 16 distinct modules. Care has been taken to modify or remove topics which have lost relevance in today's context, and add new topics or even create a new separate module on a topic that may have gained much importance. The efforts are also to provide learning through interactive mode of teaching. By offering selective modules for short-term specialised training, not only would the institute be able to use it existing resources more effectively, but it will also enlarge the scope of the training without compromising on quality and with minimum additional expenditure.



Ajoi Saxena

Officer trainees of XVI Diploma Course at National Zoological Park, Delhi

The noticeable additions are specific modules on 'Conservation Biology', 'Environment Impact Assessment', 'Wetlands & Marine Coastal Area Management' and 'Ecodevelopment for Biodiversity Conservation'. Eligible officers who want to get trained in a particular field or subject, can now be nominated even for specific modules.

The XVII Diploma course was the first to be conducted in the new modular form. It began on 1 September 1995 with 15 officer trainees representing 11 states and one participant from Gujarat Agriculture University, College of Veterinary Science and Animal Husbandry, Anand as part of WII-FWS joint project on "Cooperative Wildlife Health Programme". As part of the course, the following field tours have been conducted so far :

(1) **Orientation Tour - 6-14 October 1995,** to Sariska tiger reserve, Rajasthan, where the trainees were familiarised with animal signs, bird watching, different habitats, wildlife values of the area, tourism and human-wildlife interface situations;

(2) **Techniques Tour - 2-15 December 1995,** in Rajaji national park, UP where the trainees learnt about different methods of vegetation analysis and habitat evaluation, census of wild ungulates, assessment of biotic pressure on wildlife habitats, computation of data and scientific report writing, besides undertaking exercises to understand the intricacies of different techniques; and

(3) **Management Tour - 10 February - 10 March 1996,** to National Museum of Natural History, New Delhi; Keoladeo-Ghana national park, Bharatpur; Guindy national park, Aringnar Anna Zoological Park, Madras Crocodile Bank Trust, and Vedanthangal bird sanctuary, all Tamil Nadu; Point Calimere sanctuary (coastal ecosystem/mangroves); Gulf of Mannar marine national park; Kalakad-Mundanthurai tiger reserve, Tamil Nadu; Trivandrum wildlife circle, Periyar tiger reserve, Top Slip, Mudumalai wildlife sanctuary, Zoo Outreach Organisation, Coimbatore and Salim Ali Centre for Ornithology & Natural History, Coimbatore. The tour effectively exposed the trainees to a variety of management practices across several protected areas and zoological parks in the country. Besides getting acquainted with the environmental values of these areas, and their management issues - problems and mitigation strategies, including management capabilities and the human dimensions, the trainees also looked into the role of protected areas, zoos and institutions in interpretation and conservation education.

The performance of the officers trainee has been assessed by the respective Module Coordinators under the categories of class interactions, small assignments, short seminars, quiz, brief objective tests, group discussions and practicals. The course will end on 31 May 1996.

Special Diploma Course in Wildlife Management for Wildlife Rangers from Sri Lanka : The Government of India has approved two nine-month courses in wildlife management to be conducted by WII for wildlife rangers from Sri Lanka. These courses are part of the GEF Project of the Department of Wildlife Conservation (DWLC), Sri Lanka, and supported by funding from the FAO. The first of these two courses was conducted from 1 July 1995 to 29 March 1996, in which 19 Sri Lankan trainee rangers participated. It was also the first diploma level course which WII conducted exclusively for candidates from a foreign country.

The course curriculum, developed in close consultation with HS Panwar (former Director, WII), Senior FAO Advisor to DWLC, Sri Lanka, was a blend of classroom teaching, group field training and individual field task assignments. The aim was to turn 'wildlife science' into a rich field experience and impart proficiency and technical skills in wildlife and protected area management, covering biological, management and human aspects, in a typical developing country situation in south and south-east Asia.

The course was divided in two phases. The first phase of six months was based at the National Training Centre, Giritale, Sri Lanka, for which WII deputed four faculty

V. B. Mathur

Participants of the Special Diploma Course during a field exercise

members over different periods to conduct the training. Besides classroom teaching and written assignments, the trainees underwent 13 weeks of field training - five weeks of orientation, study of management issues and application of field techniques in seven protected areas and two assignments of four weeks each: one based on application of field techniques and the other on a management issue in selected PAs. The assignments led to the preparation of a scientific document and individually presented seminars, which were evaluated by external examiners.

In the second phase of three months, the course was located at WII and all the three faculty divisions and the ecodevelopment cell were involved in the training. Here, besides topping up of some of the subjects dealt with in the first phase, several new areas were also introduced, such as advanced computer applications, exposure to EIA, use of laboratory, wildlife health and wildlife management planning. New training areas were also included - field research and monitoring, ecodevelopment initiatives and an exercise in preparation of a management plan. The performance of the trainees was continuously evaluated through suitably structured tests including capability in the field and assignments.

At the successful completion of the course, the trainees were awarded Special Diploma.

Certificate Course in Wildlife Management

The XI Certificate course began on 1 May 1995. There were seventeen officers trainee, including one from Bhutan, in the course.

The course curriculum, imparted through a mix of classroom lectures, practical and field work, covered a wide range of subjects pertinent to the practical aspects of the scientific management of protected areas. Topics covered included biology of Indian mammals, wildlife conservation and management, wildlife health, wildlife tourism, conservation education and interpretation, wildlife law and human dimensions.

There were two field visits. The Orientation-cum-Techniques Tour to Rajaji national park from 22-31 May 1995 exposed the trainees to issues and problems in elephant conservation and value of corridors in maintaining the population of large mammals, techniques in wildlife population monitoring, habitat evaluation, vegetation quantification and mapping. Human landuse practices, quantification of human pressures and its impact on the wildlife habitat and the socio-economic aspects of the surrounding villages and the Gujjars in particular were also looked into.

The Management Tour to Dudhwa national park, Katterniaghat wildlife sanctuary, Kishanpur wildlife sanctuary, Kufri nature park, Kannawar wildlife sanctuary, besides Delhi zoological park and National Museum of Natural History was held from 26 June to 14 July 1995. The emphasis here was on wildlife tourism, people's dependence on protected areas, human-wildlife conflicts and their resolution through ecodevelopment, *ex-situ* management of endangered species and the role of conservation education and interpretation.

The course concluded on 31 July 1995. The Wildlife Conservation Silver Medal for the 'Top Trainee' was bagged

by P Sreenivasa Rao from Andhra Pradesh. The institute's award for best practical wildlifer was given to Bhupendra Nath Talukdar from Assam.

SHORT COURSES

Interpretation and conservation education course: Interpretation and conservation education have become vital tools in generating environmental awareness. However, due to lack of trained personnel, state wildlife organizations, zoos and botanical gardens, tourism departments and NGOs often feel constrained in planning and implementing systematic and meaningful interpretation and conservation education programmes and activities for the visitors and the public at large. It is towards filling this lacuna that WII conducts this short course in "Interpretation and conservation education".

The course is aimed at the staff of national parks, sanctuaries, zoos, defence services, wildlife tourism agencies and NGOs. It seeks to orient the participants to the need and value of environmental interpretation and education as a management tool, and provide them with basic knowhow and minimal skill in designing interpretive publications like folders, brochures, posters, etc. and audio-visual programmes so that they are able to interact more effectively with related media professionals whose services they would be seeking. The emphasis of the course is on practical training, allowing the participants to learn and practice a number of approaches used in presenting ideas and information to diverse target groups.

"Interpretation as a management tool". Participants discussing the issue at Malsi Deer Park

This year, there were 19 participants in the course(21-30 August 1995) 11 from the forest department, 5 from NGOs and 3 from WII itself. Topics discussed were India's rich natural heritage, need for conservation education, nature photography, presentation skills; interactive teaching, publication designing, writing for various target groups, etc. Resource persons included some faculty members from the institute besides eminent individuals and professionals from the field. There were three field trips planned but only one - to Malsi deer park - could be undertaken due to the prevailing political unrest in Dehra Dun.

Endangered species and zoo management course: In view of the rapidly developing concepts of managing wildlife in captivity, the capacity of the zoos to complement field conservation efforts and the need to expose India's zoo staff to the new concepts, policies and techniques in the day-to-day management of zoos and captive breeding areas and sanctuaries, WII has been actively conducting this training programme regularly since 1990.

Broadly, there are two courses under this programme conducted every alternate year - (1) for zoo directors and other high ranking officials, and (2) for middle-level officers, veterinarians and curators. The course for zoo directors largely focuses on policy level issues and gives an exposure on the emerging modern concepts in zoo management. The latter course is more practical oriented, emphasizing techniques involved in the day-to-day management of captive animal facilities, and including hands-on excercises.

This year (27 Nov - 9 Dec, 1995), the course (sixth in the series), was for the middle-level zoo professionals, sponsored by the Central Zoo Authority and conducted in collaboration with Karnataka Zoo Authority at Sri

Chamarajendra Zoological Gardens, Mysore. There were 27 participants from all over the country, of which 22 were from forest departments or from zoos run by the government, three from private captive animal facilities, one from an NGO and one an Assistant Professor teaching forestry including a course on captive animal management. Training included classroom lectures, discussions and practical exercises. The trainees also had to make at least one presentation each. Study tours were taken to Aringnar Anna zoological park, Vandalur and Madras Crocodile Bank (both Madras), Regional Natural History Museum, Mysore and Bannerghatta safari park (Karnataka).

S. Wilson

"Electric fencing a barrier against crop damage" Demonstration of the technique to the participants of 3-week capsule course

Compulsory course in wildlife management for IFS officers : This is a regular short course sponsored by the Ministry of Environment and Forests, Government of India under the compulsory training programme for IFS officers. The specific objectives of this course are to acquaint the participants with (i) the basics of wildlife science i.e. biological (animal-habitat) and management aspects; (ii) the critical issues in PA management and the plausible strategies which can be adopted; (iii) the conflicts that arise at the interface between PAs, their causes and the eco-development approach to mitigate these problems; (iv) how to accommodate concerns for 'conservation of biodiversity in forests other than PAs' without adversely affecting the main forestry objectives; and (v) how to work with local communities to achieve the above in order to ensure effective conservation of biodiversity.

In the present course (4 - 22 Dec, 1995), there were 17 participants from Andhra Pradesh, Bihar, Gujarat, Himachal Pradesh, Uttar Pradesh, Orissa and Karnataka. The venue was a hotel on the bank of river Ganga in Rishikesh which is in close proximity to Rajaji national park. The course methodology included interactive discussions between a panel of experts and the participants, a series of guest lectures and case study presentations by scientists and managers. Several field visits were also organised to different parts of Rajaji national park and Corbett national park to discuss management issues in the field situation as well as to give demonstration of various field techniques. The participants were provided with a wide variety of relevant reading material.

While the senior faculty members of the Institute provided the major inputs for the course, substantial support was also obtained from national and international experts.

EDUCATION PROGRAMME

M.Sc in Wildlife Science : Wildlife and animal ecology are relatively new subject disciplines in the Indian university education system. So far, only two other institutions in the country offer a full-time post-graduate degree in wildlife science. This two-year (four semesters) course at WII is thus a response to the vital need for trained research biologists and wildlife scientists to further the cause of wildlife conservation in India and elsewhere.

At the end of the last reporting period, the students of the IV batch were in the field gathering data for their dissertation. These field projects have since been completed,

and the dissertations were submitted in June. These were evaluated by a panel of three external examiners and the viva-voce was held in July 1995. All the seven candidates have successfully completed the Masters course with high first class.

The National Entrance Test for V batch of the M.Sc course was held in June 1995, and the course itself commenced on 19 July 1995. There are eleven students in this batch, including one from Nepal. In the first semester, teaching included classroom lectures, computer training and laboratory work, besides field tours to Rajaji national park (UP) and Sariska tiger reserve (Rajasthan). The Ist semester exams were conducted in December 1995. The papers for the examination were - *Community Ecology & Population Ecology, Physical Environment and Vegetation*, and *Introduction to Wildlife Biology & Quantitative Methods*, besides *computer*, *laboratory* and *field practical examinations.*

The IInd Semester began in mid-January 1996 and is now underway. The students undertook a Conservation Practice Tour to Meghalaya and Assam. Here they visited Balpakram national park, Nokrek national park, Pitcher plant sanctuary and areas of elephant-human conflict in West Garo hills in Meghalaya. In Assam, they visited Kaziranga national park and the Guwahati zoo.

WORKSHOPS, SEMINARS, CONFERENCES

Organised by WII

Research workshop (22-23 April 1995)
WII conducted a two-day workshop in Mundanthurai under the aegis of the Forest Research Education and Extension Project of the World Bank in the Kalakad-Mundanthurai tiger reserve. One of the components of the projects is the "Research on Conservation of Biodiversity" for which WII is the nodal agency. This was a preparatory workshop organized to introduce the research project and, more importantly, identify the research priorities in the tiger reserve. Toward this, the managers and scientists - from namely the Tamil Nadu Forest Department, Madras University, Sundaranar University, Salim Ali Centre for Ornithology & Nature Conservation (SACON), and Alwarkurichi Siddha Institute, Tirunelveli - were brought together in this workshop.

The workshop discussed the research programme in all its proposed details including the various terms, conditions and expectations of meeting the management requirements and linkages with ecodevelopment initiatives in the protected area. Resource mapping, fire management and population viability of Nilgiri tahr were seen as the three important research areas from the point of view of the management. The attending scientists also presented a brief overview of the work proposed by them including the logistic support required. The proposed subjects ranged from anthropology and ethnobotany to crop damage and other ecological studies, - avian biodiversity, study on the slender loris, vermiculture, etc. The Field Director of the tiger reserve was requested to make available accommodation for the research personnel in the Project Tiger Area in order to facilitate the study.

Integrated Protected Area System (20-22 June 1995)
As part of the consultancy in the World Bank aided Andhra Pradesh forestry project to develop an Integrated Protected Area System for the conservation and management of biodiversity (see section on 'Consultancies'), WII organized a workshop at Hyderabad to present its consultancy draft report. The participants numbered over 85 and included AP forest, wildlife and other officials besides representatives from non-government organizations working in the field of conservation.

The draft report identified and suggested the gaps to be filled up for IPAS and made recommendations on ecodevelopment, extension education, organization and human resource development of IPAS management. Recommendations were also made on research and developmental needs, assessment and monitoring methods of biodiversity, habitat and species, and on the involvement of other government and non-

government agencies in IPAS management. At the workshop, the participants examined and discussed the recommendations. The resultant observations and feedback would be used in finalizing the consultancy report to be presented later.

Population Habitat Viability Analysis (July 1995)

WII played host to a "Population Habitat Viability Analysis (PHVA) Workshop for Barasingha" at its Chandrabani campus. Dr US Seal, Chairman, CBSG, Minnesotta; Dr J Ballou from the National Zoo, Washington DC and Ms Sally Walker from CBSG-India, alongwith WII faculty organised this workshop. Around 60 participants contributed to the deliberations of this workshop and the PHVA workshop report has since been published.

The PHVA workshop was followed by a week long training course in 'Small Population Biology and CBSG Processes'. This was essentially meant for WII faculty and researchers but three forest department representatives also participated.

Environmental Resource Information Network (25-26 August 1995)

WII has received an Institutional Development Fund (IDF) grant from the World Bank for the development of an Environmental Resource Information System (ERIS). As part of this, a national workshop on the Development of Environmental Resource Management Network (ERMN) was organised at Hotel Madhuban, Dehra Dun. There were 48 participants representing 24 national level institutions including non-governmental organisations at the workshop. WII engaged the services of a professional group, Institute of Agricultural Extension Management (MANAGE), Hyderabad, to facilitate the workshop.

The objectives of the workshop were to (a) develop a common understanding about what kind of information ERMN would contain; (b) reach a broad consensus on the institutions/agencies that would be included in the ERMN; (c) discuss hardware/software requirements alongwith costs to make the network operational; and (d) outline post-workshop steps for operationalizing the ERMN. The workshop recommended the constitution of an Advisory Committee with Prof LM Nath as Chairperson and Dr VB Mathur (Scientist SE, Management Faculty, WII) as Member Secretary to operationalise the ERMN. The recommendations of the workshop were published in the workshop proceedings.

Annual research seminar (25-26 September 1995)

Annual research seminar is seen as a valuable event in terms of evaluating the institute's completed and current research projects and thereby its research agenda. It also provides the young researchers and biologists an exercise in public presentation of their research.

The IX Annual Research Seminar (ARS) was held at WII's Chandrabani campus on 25-26 September 1995. There were about forty guests including chief wildlife wardens, members of WII's Society, Governing Body, RAC and SAP and wildlife scientists attended the ARS, besides scientists from other sister organisations in Dehra Dun and a few NGOs and media representatives.

As many as 28 presentations, spread over ten sessions, were made by the institute researchers and a few faculty members. For the first time M.Sc dissertations were also included - six of the students who passed out in July 1995 and were now working as Technical Assistants gave presentations on their dissertation work. A presentation based on WII's participation in the Indian Expedition to Antarctica was also part of the ARS. The other presentations were based on five completed and 13 ongoing projects.

The presentations were judged by a panel of four judges, namely Ishwar Dass, Prof AH Musavi, JC Daniel and Dr Ullas Karanth. Awards consisting of a merit certificate and books worth Rs 750/- each were given to the following, in alphabetical order : Rohan Arthur, TA - *Disturbance and coral community structure in the inter-tidal coral reefs of the southern Gulf of Kutch, Gujarat*; Yogesh Dubey, JRF - *Development of spatial wildlife database for Tadoba-Andhari tiger reserve, Madhya Pradesh*; Charudutt Mishra, TA - *Revegetation patterns in Asola-Bhatti wildlife sanctuary, Delhi*; Bivash Pandav, JRF - *Olive ridley sea turtle* (Lepidochelys olivacea) *and the arribadas along the Orissa coast - A review of the 1995 nesting season*; Christy A Williams, JRF - *Elephant-human conflict on community lands in Garo Hills, Meghalaya.*

Army workshop (9-14 October 1995)

WII and the Central Command of the Indian Army jointly organised a workshop on "Environment and Nature Conservation" for Senior Army Officers at the institute's Chandrabani campus. It was attended by 20 officers of the rank of Colonel and Brigadier. These officers were seen as the facilitators for creating and spreading conservation awareness among the army cadres, their children and the local people of the area under their jurisdiction. The objectives of this workshop were to provide an overview of the environmental issues and provide the participants with a primer on the techniques of collecting, collating, analysing, interpreting and disseminating scientific information.

The workshop covered issues such as the rapid depletion of biodiversity, impact of army installations and activities on the ecology of the area, ecological interdependence of living and non-living components, history of wildlife conservation in India, constitutional and legal mandate for conservation in India, and the need for creating biogeographically representative network of protected areas.

A field tour was organized to the Rajaji national park to expose the participants to field situations and problems - the conflicting landuse in the park and how this was affecting the conservation values of the Siwalik ecosystem, the highly disturbed Chilla area and the not-so-disturbed Dholkhand area, the army ammunition depot along the Kunnao Power Channel, both of which have greatly hampered the movement of the elephant herds through the natural corridor that had existed earlier, thus confining them to small pockets.

Visits were also organised to the army eco-task force area and Indian Institute of Petroleum, Dehra Dun.

Illegal wildlife trade (21-24 November 1995)

A workshop was organized on "Control of Illegal Wildlife Trade in India" at Dehra Dun. This was WII's first workshop on this theme and attended by 10 officers from Customs, Police, Intelligence, Wildlife, Border Security Forces and NGOs. The workshop was structured to discuss the issues related to wildlife trade such as Indian Wildlife Protection Act, Role of CITES in International Wildlife Trade, Anti-poaching measures in India, contribution of different agencies and wildlife forensic techniques.

Attended

Wildlife database (1-5 August 1995)

Dr VB Mathur, Scientist SE (Management) and faculty incharge Computer/GIS cell attended the international workshop on "Internet Application and Electronic Information Resources in Forestry and Environmental Sciences" at the European Forest Institute (EFI), Joensuu, Finland. This was sponsored by IUFRO's Working Parties for the subject area - Information Management and Information Systems and Terminology, on the eve of IUFRO's XX World Congress (see below). The workshop offered tutorials on setting up, using and accessing Internet services and provided opportunities for reviewing ongoing projects and existing network applications in forestry, wildlife and related ecological and environmental sciences. At the workshop, Mathur made a presentation on "Managing national wildlife database system : A case study from India", detailing the institute's research project on the theme.

IUFRO world congress (6-12 August 1995)

The XX IUFRO World Congress was held at Tampere (Finland) and attended by over five thousand participants from all over the world. The Congress, held once in five years, provides a unique means of maintaining the IUFRO's fundamental role of networking among members while increasing the intensity and frequency of inter-disciplinary collaboration within Union, and with the other organisations and groups outside the Union.

The theme of this year's congress was "Caring for the Forest: Research in a Changing World" and special plenary, technical and poster sessions were organized on varied aspects of the theme. From WII, Dr VB Mathur and Dr Asha Rajvanshi, Scientist SD and incharge EIA Cell, attended the congress supported by the Scientists Assistance Programme of the Congress. Rajvanshi presented a paper "Impacts of development projects on wildlife values of forest ecosystems in India" under the divisional theme - Wildlife and Habitat Management. Mathur presented a paper "Forest corridors and connectivity: New initiatives for wildlife conservation in India" under the divisional theme - Landscape Structure and Faunal Diversity. He also presented a poster on the above paper during the poster session.

Zoological society (24-25 November 1995)

The Zoological Society of London and the Mammal Society organized their 71st symposium entitled "Behaviour and ecology of riparian mammals" at London. Dr SA Hussain (Scientist SD, Management) was assigned to attend this symposium. Hussain presented a paper titled "Feeding ecology of smooth-coated otter in National Chambal sanctuary" under joint authorship.

After the symposium, Hussain visited the Wildfowl and Wetland Trust, Slimbridge, to see the management of estuarine ecosystem for the conservation of avifauna. The visit was also marked by important discussions on WII's future wetland conservation programme with officials of the Trust and Wetland International. Hussain's visit was funded by the Zoological Society of London.

Biodiversity management (27 November - 1 December 1995)

V Sukumar, LAN Manager, was deputed to attend the KUFF-ABC workshop on "Biodiversity Information Management Systems" (BIMS) conducted by Asian Bureau for Conservation at Kasetsart University, Bangkok, Thailand. The workshop was attended by 25 people from 16 countries in the Indo-Malayan realm.

The objective of the workshop was to introduce a software package called BIMS. This package is a link between conventional database files and GIS coverage, allowing evaluation and monitoring of the conservation status of species, wildlife habitats and individual sites. BIMS has been developed as part of the World Bank sponsored review of Protected Areas and Biodiversity in the Indo-Malayan realm. The data for the review were loaded into this software for distribution and for continued use and updating in-country.

Sukumar's visit was funded by the Asian Bureau for Conservation. The training will prove useful in the light of WII's ongoing work on developing and strengthening national wildlife database.

Otter meeting (15-16 March, 1996)

The first IUCN/SSC Otter Specialist Group meeting of the Asian Section under joint sponsorship of Otter Research Group, Japan, was held at the Asian Institute of Technology, Bangkok, Thailand. As a member of this group and coordinator for Asia, Dr SA Hussain attended this meeting. The objectives of the meeting were to discuss the conservation status of otters in Asia, strengthen networking among those interested in otter conservation and research, and to prepare a preliminary draft of a work plan for the conservation of otters in Asia.

Participants included representatives from nine Asian countries. Hussain presented two reports on the status of otters in northern India and Bangladesh. Another report, "Importance of radio-tracking in the study of otters : A case study of smooth-coated otter in National Chambal sanctuary" was presented in the scientific session of the meeting. Hussain's attendance at the meeting was funded by the Otter Research Group, Japan.

COURSES, TRAINING AND STUDY TOURS

*** Dr. Ravi Chellam, Scientist SD to USA; Feb-May 1995.**

Ravi was associated as an intern with the Conservation and Research Centre at Front Royal, National Zoological Park in Washington DC and the Bronx Zoo in New York. He also successfully completed a week long course in the "Science of Zoo and Aquarium Animal Management" conducted by the American Zoological Park and Aquarium Association through the AZA Conservation Academy at St Louis.

The institutions with which Ravi worked offered opportunities for him to work at all levels of management, giving him a complete understanding of modern zoo management. He also met with the officials of the AZA and had wide ranging discussions on policy issues pertaining to captive animal management and to the linking of *ex-situ* and *in-situ* conservation. During his visit, Ravi made five presentations based on his work with Asiatic lions in Gir forest at the various institutions he visited or worked with.

*** Dr. B.K. Mishra, Scientist SE to UK and USA, 1 April - 15 May 1995.**

Mishra visited the University of Reading, UK and Clark University, USA. While in UK, Mishra attended a workshop on "Communication and Extension for Rural People" where he presented a paper entitled "Communicating with children and villagers of Chandrabani village, Dehra Dun for sustainable development". In USA, Mishra worked at the School of International Development (IDS), Clark University, Massachusettes, on themes of gender analysis, sustainable resource management, community institutions and long term development, and use of PRA and GIS in these studies. He also gave a series of lectures to the students and faculty of IDS on 'Problems and prospects of wildlife conservation in India', 'Human dimensions management and possibilities of ecodevelopment around wildlife protected areas of India'.

*** Dr PK Mathur and Dr S Chowdhary, Scientists SE, to Bolivia and Costa Rica, 27 May-27 June 1995**

Mathur and Chowdhary visited south and central American countries of Bolivia and Costa Rica. This was as part of WII-UNDP project for developing management planning capabilities for wildlife conservation in tropical evergreen forests which are the richest repositories of biological diversities on earth. Today, major global environmental issues are linked with the conservation of these forests which are nearly all located in developing countries beset with poverty, under-employment and rapidly growing human populations. The specific objectives of the tour were to understand comprehensive PA management system for biodiversity conservation; to understand area specific management of endangered species and ecosystem, and habitat interface conflicts; and to see research initiatives in biodiversity conservation and management.

In Bolivia, they visited Beni national park and Neol Kamf Marcado national park to see first hand the reserve protection systems, species conservation and management, and people oriented programmes. In Costa Rica, similar visits were organized to protected areas in the Cordillera Volcanic Central Conservation Area, Arenal Conservation Area, Gunacaste Conservation Area, and Central Pacific Conservation Area to see conservation support programmes, park management research and education programmes, conservation management educational programmes, silviculture techniques for native species biodiversity, etc. Mathur and Chowdhary also visited various institutions, organizations and universities involved in biodiversity conservation, and held discussions with FAO officials on PA management systems.

*** SK Mukherjee, Director to Thailand (25-29 June 1995) and Laos PDR (31 October-2 November 1995)**

In his capacity as the National Project Director of the WII-UNDP project "Strengthening Wildlife Management and Ecodevelopment Management Capabilities", Mukherjee held the consultative meeting of Senior Field Officers, held in Thailand. He also attended the IUCN Meeting of the South

and Southeast Regional Members, which was held at Vientine, Laos PDR.

*** MS Rana, Librarian to Thailand, 5 June-25 August 1995.**

Rana was one of the only three librarians from developing countries (and the only one from India) who was granted the International Federation of Library Associations and Institutions (IFLA) scholarship this year to attend a 12-week course on "Emerging Technologies for Automated Information Services and Management". The course was organized by the Centre for Library and Information Resources, Asian Institute of Technology, Bangkok, Thailand, and in all there were 22 participants from 11 countries at the course.

The objectives of the course were to improve library and information management skills and provide expertise in computer application in library and information organization and management. Themes and subjects covered were - effective communication skill, organization of information, computer application, networking, issues in information services and information dissemination. Besides attending lectures and video programmes, participating in discussions, hands-on exercises and workshops, the participants were assigned projects and required to make presentations.

*** Ruchi Badola, Scientist SD to UK, 28 August-4 December 1995.**

Badola visited the Institute of Development Studies, Sussex (UK) as an individual study fellow to work on the research proposal "Critique of people oriented conservation policies in India - An entitlements approach". The objective of the programme was to refine and enhance her concepts in the field of people-park interface. Besides working at the institute and interacting with its various faculty members, Badola visited several other institutions, the Oxford University and Peat District national park. The outcome of the fellowship was a working paper on the research proposal. The paper will help park managers and other scholars understand the concept of entitlements approach in conserving natural resources by eliciting participation of the people living in and around the protected areas.

*** Azra Musavi, Researcher to China, 6 September-10 October 1995**

Musavi attended Wildlife Conservation and Management Training Programme's eighth annual "Conservation Biology and Wildlife Management" course in China. Organized by the Smithsonian Institution, Washington DC (USA), the course was conducted by International Centre for Conservation Biology, East China Normal University, Shanghai, and Wuyishan Man and Biosphere Reserve, Fujian Province. The course is intended for researchers, resource managers and environmental educators, and its syllabi included lectures on data analysis, public education, wildlife conservation and practical field experience. Musavi's programme was funded by WWF-USA, WWF-India and the Smithsonian Institution.

*** Dr NPS Chauhan, Scientist SD to New Zealand and Australia, 30 September - 17 December 1995.**

The fellowship, under the WII-FAO-UNDP collaborative project, provided Chauhan training in New Zealand and Australia. The training was in wildlife management in areas of high human pressures and conflicts, and particularly in the management of small and locally overabundant wildlife populations, developing non-invasive methods to study eco-physiology of mammals, use of wildlife barriers separately and in conjunction with electric fences and in resolving wildlife-people conflicts. In New Zealand, he visited the Ruarkara Animal Behaviour and Welfare Research Centre, Mount Bruce Bird Breeding Centre, Massey University and the Department of Conservation in Hamilton. His visit here was partly supported by The Gallaghar Group Ltd., Hamilton. In Australia, he visited Taronga and Western Plains zoo and the Department of Land Conservation besides several field sites. The training helped Chauhan in understanding management of endangered species in captivity, translocation and reintroduction programmes, manipulation of overabundant wildlife populations and impact of logging and other biotic pressures on wildlife.

OTHER STUDY TOURS

Three veterinarians (namely, **Dr AB Srivastava - Jabalpur, Dr MG Jayathangaraj - Madras, and Dr Nasser Ahmad - Guwahati)** who undertook the Diploma course in Wildlife Management at WII last year, under the WII-USFWS collaborative project (Phase I), went on a study tour to the USA from 15 July to 23 September 1995. While there, they were exposed to techniques and practices in disease diagnosis and investigation in free ranging and captive wildlife at various wildlife health investigation centres. They also attended an international conference on "Wildlife Diseases" in East Lansing, Minnesota on 12-17 August 1995, including several pre-conference workshops on immobilization and necropsy techniques in wild animals. Dr PK Malik, Scientist SE, incharge wildlife health, also attended the conference.

RESEARCH

Research at WII, being conducted in the different biogeographic zones of the country, covers a range of ecological, biological, socio-economic and managerial aspects of wildlife conservation. The aim is to generate scientific information, create a group of trained field biologists, socio-economists and wildlife managers, and evolve relevant study techniques suited to the Indian conditions so as to strengthen conservation efforts. The studies also help the institute faculty keep abreast of the current field situation, management needs and research trends, and thus constantly enhance its professional capabilities and update its teaching inputs.

WII's research projects are approved by its *Research Advisory Committee (RAC)* which ensures that they conform to the national conservation priorities. The RAC is a 17-member committee comprising eminent conservationists, academicians and representatives of scientific organizations as well as state wildlife organizations and five Chief Wildlife Wardens who are invited on an annual rotation. It meets periodically to oversee and review the institute's current research and set the tone for its future studies.

At the beginning of the reporting year there were twenty ongoing projects, of which nine have been completed. Eighteen new research projects have been initiated during the reporting period. Of these new projects, two are under the World Bank GEF scheme, one a part of the World Bank Forestry Project in West Bengal, seven others in collaboration with the US Fish and Wildlife Service and one with US Forest Service.

A national level entrance test for the recruitment of researchers was conducted in November 1995. Based on this, 22 JRFs and 3 RAs were recruited to the research staff of the institute during the reporting year.

Completed 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
Researcher : Yash Veer Bhatnagar

India's contribution in the international effort for the conservation of Antarctica's unique biodiversity by initiating research programmes in its Dakshin Gangotri and Maitri field stations, has been significant. Last year, WII was represented (by Sathyakumar) in the Indian Scientific Expedition to Antarctica for the first time for which this project was particularly developed, and approved by the National Coordination Committee on Antarctica Expeditions (NCCAE).

The objectives of the project are to (i) establish a baseline status for wildlife in the Indian Ocean, Dakshin Gangotri, Maitri and Indian Bay regions in Antarctica; (ii) identify species/taxa to monitor; and (iii) design monitoring protocols.

Y. V. Bhatnagar

Crabeater Seal (Lobodon carcinophagus) in Antarctica

WII was represented this year by Bhatnagar, who participated in the XV Indian Scientific Expedition to Antarctica (December 1995-March 1996). During this summer expedition, baseline status of birds and mammals has been assessed. Fifty species of birds, fourteen species of mammals and four species of other faunal groups were recorded during the study. Aerial surveys were conducted to estimate the abundance of Adelie Penguins, Emperor Penguins, Crab eater seals and Weddel seals in the Indian Bay region of Antarctica. Attempts have also been made to standardize the monitoring procedures. Improved classification of wildlife habitats based on aerial surveys, satellite imagery and limited ground truthing were done.

WII expects to participate in the forthcoming expeditions as well. In the next expedition work will be done to establish the baseline status, standardize monitoring techniques and design monitoring protocols for the identified species/taxa.

*** Strengthening the National Wildlife Database:Phase II.**

Faculty : Dr VB Mathur
Technical Assistants : Ratna Singh and JS Kathayat

The objectives of the computer-based National Wildlife Database are to (a) provide information on the conservation status of animal species, habitat and the network of PAs in India; (b) establish linkages with similar computer based data centres; and (c) provide extensive bibliographic support to wildlife researchers, park managers and other interested users.

During 1995-96, the main thrust has been on data input, data validation, software modification to meet new requirements and creation of visual outputs in the form of maps, graphs and charts. Efforts were made to port the database from the Foxpro environment to the Oracle client/server environment which is a far more powerful RDBMS, suitable for networking than the existing Foxpro system. Oracle is being visualised as the stepping stone for the future needs of the database, especially GIS applications and networking.

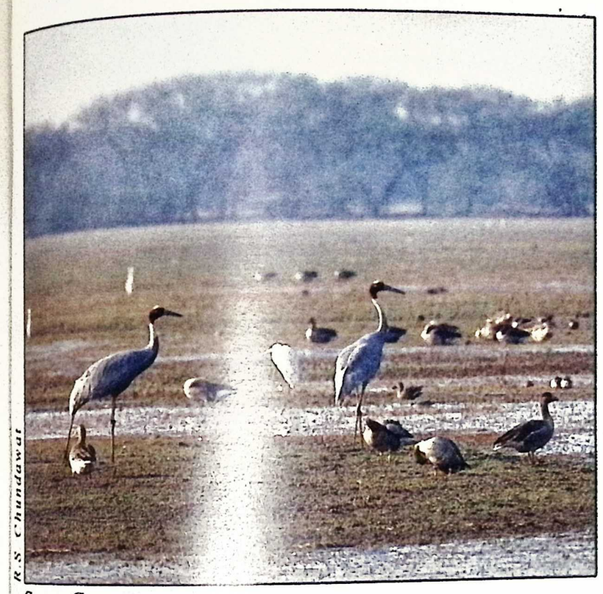
The references on wildlife science for the protected area bibliographic databases went up to nearly 16,000. Key words were entered to facilitate the bibliographic searches. The protected area database was updated further up to December 1995 - there were 530 protected areas including 85 national parks and 445 wildlife sanctuaries in India, covering 1,48,531 sq km which is 4.5% of the total geographic area of the country.

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

Faculty : BC Choudhury and Kishore Rao (MoEF)
Researchers : Divya Muddappa, Jatinder Kaur, Samar Singh Pawar, Rashid Raza and Rathin Burman

Over the last 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, together with the International Crane Foundation (ICF), attempted to re-establish a population through restocking of captive-bred Siberian cranes obtained from breeding centres in Germany and the USA. Captive bred Siberian cranes were brought to

the Keoladeo Ghana national park, Bharatpur, before the normal, expected arrival of the wintering Siberian cranes, in the hope that the latter would act as "carriers" or "guides" to the captive bred cranes on their return migration. However, no Siberian cranes wintered that year !



R. S. Chundawat

Sarus Crane

The next year, it was agreed to initiate a study on the ecology and migration of common cranes. Since the Siberian and the common cranes have a somewhat overlapping migratory flyway over Afghanistan and Pakistan, and the migration in cranes is believed to be a learned process, it was thought that the common cranes could then act as "carriers" to the Siberian cranes. At the same time, it was also planned to carry out surveys all along the historical wintering range of these Siberian cranes in India in order to locate other wintering sites, if any. To carry out this survey, WII was assigned a short-term project.

It was also decided that the researchers would (a) survey for the wintering range of the common cranes in India, locate their large flocks and determine the habitat and population status; (b) identify confirmed and other possible flyways between breeding and wintering sites of common cranes using satellite tracking transmitters; and (c) identify important large flocks of common cranes in well protected wetlands to act as possible "carriers" for captive bred Siberian cranes.

The project commenced in July 1995. The first tasks were to conduct a literature search and network individuals and organizations working on cranes in India. Field investigations began in November 1995. The survey covered the states of Rajasthan, Gujarat, Uttar Pradesh, Madhya Pradesh, Bihar, West Bengal, Assam and Arunachal Pradesh to record the status of wintering Siberian, common, demoiselle cranes and the resident sarus cranes. The conservation status of the wetland habitats and their prospects as protected areas was also evaluated.

The field work covered over 200 wetland sites, from which one site in Madhya Pradesh and another in Assam have been shortlisted for protecting common crane flocks. It is planned to radio-tag common cranes at these two sites to verify their migratory route and help establish a new migratory route for captive bred Siberian cranes to be released at these sites using common cranes as "carriers".

*** Status of otters and associated wetland fauna in the lower Himalayas and in Terai.**

Faculty : Dr SA Hussain

Three otter species occur in the Indian subcontinent. Most otter species live naturally at low population densities, largely because their food sources are widely dispersed and the environment is unable to support a high density of top predators within a restricted area. This is a natural system of regulating population densities. However, there has been a serious decline in otter populations worldwide, both in terms of population size and current distribution. Over-hunting, habitat destruction and pollution are the most critical factors responsible for this. The survival of otter populations in India is also believed to be under threat because of intensive trapping and loss of habitat due to the construction of dams and barrages.

An extensive network of protected areas exists in India, but no specific conservation efforts have been made for otters. At the same time, practical conservation measures for otters are impossible to develop because of limited information available on the species. In fact, except for a few stray reports, there have been no proper surveys conducted for existing populations of all three Indian species and their habitats.

This short-term research project based on field surveys attempts to fill that lacuna in our knowledge of the otters. The objectives are to (1) determine the status of otters and other aquatic fauna in the lower Himalaya and in the Terai, (2) identify the threats to their populations in this region, (3) assess the levels of interspecific competition with other aquatic fauna and anthropogenic pressures on otter populations, and (4) provide recommendations for the improved conservation management of the otters in this region.

The survey sites in the Terai areas were Ramganga, Sonanadi, Palain and Kosi rivers in the Corbett tiger reserve and adjacent wetlands; Mohana and Sohaili rivers, and *tal* and *jheel* in Dudhwa tiger reserve and adjacent wetlands; Girwa river and its tributaries, Kaudaliya river and the barrage within Katerniaghat wildlife sanctuary and adjacent wetlands; and Alaknanda river and its tributaries between Rishikesh and Gopeshwar.

The result of this survey will help put together baseline information on the status of otters and their habitat in the region.

*** Validation of the pugmark technique for individual identification and census of large felids, Gujarat.**

Faculty : Dr YV Jhala and Qamar Qureshi
Researcher: Vimal Bhuva

Tiger pugmarks are believed to have characteristics that are unique to each individual. This trait along with other associated signs like the stride and the straddle and in conjunction with monitoring of tiger movement within an area, forms the basis of the tiger census technique which has been developed from empirical evidence by field personnel. The pugmark technique is currently the only feasible and economically viable technique available for census of large felids in India.

However, this technique has not been tested scientifically for reliability and accuracy, and it gives no clue to the errors involved in the population estimates that are obtained. As such, this study was launched to test this technique for its ability to identify individual felids from their pugmarks. It also seeks to estimate the reliability and accuracy of this technique as a census tool by devising a way of generating statistical confidence intervals on population estimates obtained from the pugmark technique that will account for the errors. The census figures obtained from the pugmark technique would be compared with those from mark-recapture technique done by a non-invasive method in order to also look into the economic and otherwise feasibility of the latter technique in the Indian conditions.

During the year 1995-96, applicability of vibrissae (whisker) marking pattern for individual identification of Indian lions (*Panthera leo persica*) was validated in captive and wild lions. The applicability of the Lincoln-Peterson model and its sample size requirements for population size estimates of carnivores with varied population sizes was worked out by computer simulation models. An appropriate experimental design was then developed for such a census in Gir national park and sanctuary. The model recommended marking over 30% of a hypothetical population of 250 lions to obtain a desired level of accuracy (CV < 20%) for estimating population size.

The vibrissae technique was utilized for individual identification of 84 wild lions in Gir for conducting a mark-recapture census. The estimated population of lions (excluding cubs < 4 months) in Gir was 222. The standard deviation using Chapman 1951 estimator was ± 54.5 lions. A separate analysis of the male and female populations estimated 74± 17 males and 167± 67 females. The unbiased

estimate of the mean with its standard deviation for the total lion population by using the bootstrap method was 220±37. The Forest Department of Gujarat concomitantly conducted a labour intensive total count of lions using baits for over five days. The total count of lions in Gir national park and sanctuary (excluding cubs) was 94 males, 110 females (204 total). We recommend the use of the vibrissae identification method as a tool for monitoring, estimating populations and to develop more sophisticated models for evaluating survival and movement of lions.

Simultaneously, during the year, tracings of appropriate pugmarks of lions, leopards and tigers were obtained. These are currently being digitized and analysed using GIS for developing a statistical model that may be able to identify individuals with a certain level of probability. If this model proves to be successful then its use as a census tool for large carnivores will be tested in the field.

*** Survey of the clouded leopard (*Neofelis nebulosa*) in north-east India**

Faculty : Dr AJT Johnsingh
Researcher : Vidya R Athreya

The clouded leopard (*Neofelis nebulosa*) is a rare and endangered felid. It is listed in Schedule I of the Indian Wildlife (Protection) Act, 1972, and also in Appendix I of CITES. Within the Indian subcontinent it is found in Sikkim, northern West Bengal and the north-eastern states of India. However, there have been no intensive surveys or studies carried out on this species in India, and the information available on it is largely anecdotal or based on secondary sources.

This short-term survey was carried out in Namdapha tiger reserve, Pakhui wildlife sanctuary (Arunachal Pradesh), Balpakram national park and Nongkhyllem wildlife sanctuary (Meghalaya). Besides providing information on the presence and abundance of this creature in these areas, the survey would also help assess the feasibility of a long-term study on the ecology of the clouded leopard and identify the area for that. The field work was completed in April 1995.

A total of 113 camera trap days in Namdapha tiger reserve resulted in five incidences of a mammal crossing the camera trap site (mammal pass). No mammal was recorded in five camera trap days in Pakhui and four camera trap days in Nongkhyllem wildlife sanctuaries. The mammals recorded in Namdapha were binturong (*Arctictis binturong*), large Indian civet (*Viverra zibetha*) and Himalayan palm civet (*Paguma larvata*). The mammal pass rate at the camera traps was one mammal in 22.6 days of trap effort. A high trapping effort is required in these forests if any photographic evidence of felids, particularly of clouded leopard, is to be had.

Primates, which form an important prey base for the clouded leopard, were the most frequently encountered potential prey in Namdapha (0.27 individuals/km), Pakhui (0.25) and Nongkhyllem (0.32).

Although clouded leopard was not sighted during the survey, its jaws were seen in a village adjacent to Pakhui wildlife sanctuary and in Itanagar (capital of Arunachal Pradesh), where a stuffed specimen was also seen in a handicrafts shop. Athreya also came across a pet clouded leopard in Tura (Meghalaya), obtained from adjacent forests. Tribals residing adjacent to Namdapha tiger reserve confirmed its presence in the reserve.

Hunting of the clouded leopard may not be a serious problem in Arunachal Pradesh at this point of time as taboos in many tribal communities prohibit the hunting of felids. However, hunting of its prey species is likely to have serious implications for the conservation of this animal. More importantly, habitat disturbance due to logging is likely to pose a major threat to its survival in Arunachal Pradesh.

*** Status survey of elephants, their habitats and an assessment of elephant-human conflict in Garo hills, Meghalaya**

Faculty : Dr AJT Johnsingh
Researcher : Christy A Williams

This project is funded by 'Project Elephant' which was launched by the Government of India in 1991-92 to ensure the long-term survival of the highly endangered Asian elephant in India.

Nearly half the population of the Asian elephant is found in India, and the north-east India is estimated to have as much as half the India's population of wild elephants. The latest population estimate of elephants for the state of Meghalaya is around 2200. Of these 65% (n=1460) were counted in the Garo hills where they range over a forest area of 3600 sq km of which only 11% (ca. 410 sq km) is under the control of the forest department. The rest is under village communities and district councils. The indigenous people in this region practise *jhum* or slash-and-burn agriculture in the forest areas under their control. These factors make Garo hills a region of high elephant-human conflict.

This status survey of elephants was initiated in November 1994 and field work was carried out till September 1995. The objectives of the study were to evaluate the conservation status of elephants and to quantify elephant-human conflict. Relative densities of elephants in different areas, the influence of agricultural practices like *jhum* on elephant distribution and important corridor areas were also evaluated.

Four distinct elephant ranges in Garo hills and one in the adjoining west Khasi hills were demarcated for the purpose of discussion and management. The south Garo hills, where the Balphakram national park (BNP, ca. 490 sq km) is situated, holds the maximum potential for the long term conservation of elephants in Meghalaya. However, this potential can be realised only if the BNP is strengthened by acquiring the BNP-Baghmara reserve forest (BRF) corridor area and extending the park boundaries eastward by acquiring areas from the adjoining west Khasi hills.

The future of elephants over much of the other areas in the Garo hills is uncertain. This is mainly due to *jhum* and mining operations in areas not under the control of the Meghalaya Forest Department. Three vital corridors, including the BNP-BRF corridor, have been identified and their conservation status has been evaluated. The future of the Siju-Rewak corridor is under severe threat from proposals for limestone mining and establishment of a cement factory inside the corridor area. Any form of mining or construction activity in this vital but vulnerable corridor area would affect and cut off the elephant population continuity between the south Garo hills elephant range and the Nokrek-Angratolli elephant range. Crop raiding was the main form of elephant-human conflict and *jhum* was identified as the main reason for this conflict.

It is being recommended that a detailed study involving radio-telemetry be taken up so as to understand the conflict situation better. However, there cannot be any long-term solution to this conflict unless viable alternatives to *jhum* agriculture can be found. Meanwhile, land acquisition in identified areas crucial for elephants may be given the highest priority.

Ongoing projects

*** Study of wild animal damage problems in and around protected areas and managed forests in India.**

Faculty : Dr NPS Chauhan
Researcher : Dr KS Rajpurohit

In India, most of the wilderness areas are fragmented and disturbed by human activities. The loss of habitats and degradation in habitat quality have not only greatly reduced wildlife population in the country, but has also resulted in ecological dislocation of many species from their former ranges. The disoriented animals stray into human habitations

Damage to wheat crop by wild boar near Ranthambore Tiger Reserve

which is resulting in increasing conflicts and destruction of life and property. Cases of human killing, 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 the information on it inadequate. This project was started to study the man-wildlife conflicts in the various states, and thence develop strategies to minimize the problem.

In Phase-I of the project, various forest divisions including protected areas and managed forests were surveyed in Madhya Pradesh, Bihar and Orissa up to July 1995, and species- and location-specific problems were recorded. In Madhya Pradesh, agricultural crops are damaged mainly by wild boar, chital and blackbuck, and the problem is observed in and around 18 forest divisions, five national parks and eight sanctuaries. Cattle-lifting by tiger and leopard is quite common. Serious man-bear conflict exists in Bilaspur, Raipur and Raigarh districts. Leopard attacks on humans are frequent in Durg, Raipur, Rajnandgam and Bilaspur districts.

In Bihar, damage is mainly caused by elephant, nilgai, tiger, leopard, wolf and sloth bear. Cattle-lifting by tiger and leopard in and around Palamau tiger reserve is severe. Elephant damage to human life, property and agricultural crops in Dhalbhum, Singhbhum, Daltonganj, Gumla and Latehar districts is alarming. Child-lifting by wolves is a serious problem in northern Hazaribagh and southern forest divisions of Koderma.

In Orissa, elephants are the culprits in human killing, destruction of property and crop depredation, though sporadic cases of human casualties by tiger, leopard and sloth bear are also recorded from in and around protected areas.

In Phase-II of the project, started in November 1995, survey is to be conducted of wild animal damage problems in Rajasthan, Uttar Pradesh and Himachal Pradesh. So far, Rajasthan has been surveyed where the problem of agricultural crop damage is widespread and caused mainly by nilgai, blackbuck and wildboar. Incidences of cattle-lifting by tiger and leopard are recorded in the peripheries of Sariska and Ranthambore tiger reserves.

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

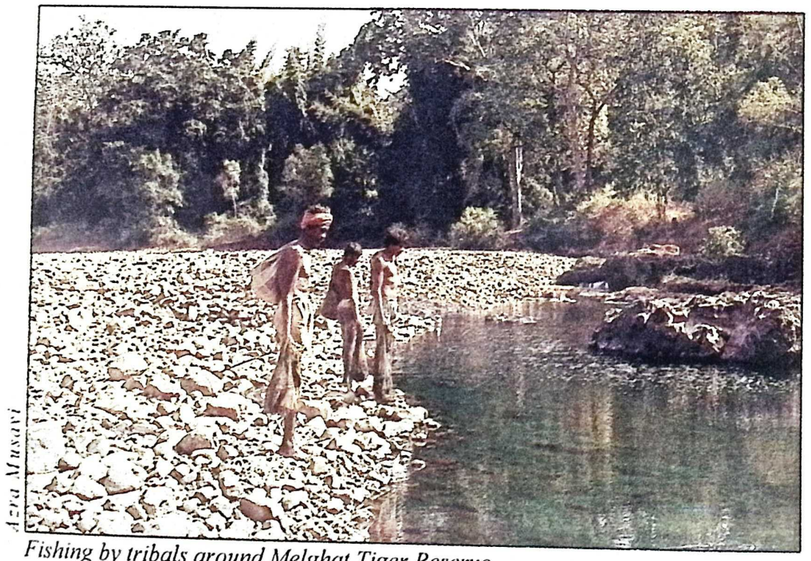
Faculty - VB Sawarkar and Dr PK Mathur
Researchers - Prachi Mehta, Azra Musavi and Sonali Pandit

Active, scientific management for the conservation of wildlife in managed forests is relatively new in India, but it has already become a significant conservation initiative and vital for 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 that would conserve forest diversity and keep a balance between the immediate and futuristic needs of the people. The three researchers involved are gathering data on three different aspects of the field study - vegetation, birds and the people-forest interface.

During the year under reporting, Mehta continued to investigate the avian assemblages and richness in various structural classes in forest stands in the Melghat tiger reserve.

The sites included both logged and unlogged areas. In four logged sites transects were established to monitor the effect of logging undertaken a year and two years ago and those being logged currently outside the PA. Observations on pre determined vegetation parameters and on monthly phenological changes were recorded.

Musavi addressed the forest-people interface in Melghat. Tribals and agro-pastorlists depend on forest based resources on which information was elicited through group discussions in selected villages, through household interviews and by sampling occupational groups. The pressure on resources was assessed by randomly selecting plots (50x20 sq mts) at varying distances from villages under sampling. Circular plots of 10 mts radius at every 200 mts interval on regularly used trails by villagers were employed for recording resource condition. Compartment-wise information on an assorted list of biotic pressures to assess the extent of such pressures was collected through field staff and subjected to random field checking. The primary data is supported by secondary information on economic activities collected from different line agencies.



Azra Musavi

Fishing by tribals around Melghat Tiger Reserve

Pandit, who was gathering information in Melghat on the vegetation structure and tree species richness relating to silvicultural treatments in the past across different successional stages, resigned from her position in June 1995 and this was a setback to the project.

*** Establishing computerised wildlife databases for conservation monitoring and evaluation in Tadoba-Andhari Tiger Reserve, Madhya Pradesh.**

Faculty : Dr VB Mathur
Researcher : Yogesh K Dubey

There are about 530 protected areas in the country. Yet, the methods of data collection or of even routine field surveys for monitoring vegetational and animal distributional changes in these PAs vary considerably in their assumptions, preciseness and accuracy, and are not properly developed or standardized. This is one of the serious drawbacks that prevents proper conservation in protected areas. In order to develop the management planning capabilities of PA managers and have their management plans succeed, it is necessary that simple, rapid, field friendly and computer compatible methods for data collection, collation and analyses be developed.

Accordingly, this project was initiated in Tadoba-Andhari tiger reserve in May 1994 with the specific aim to (i) assist the PA in setting up a computerised database on spatial as well as non-spatial attributes using ecological, management and socio-economic data; and (ii) motivate, train and involve field staff in conservation monitoring process, thereby enhancing their management planning, evaluation and monitoring capabilities.

During the year under reporting field work was carried out and data on various habitats parameters was collected. The field data was transferred to the computer based spatial database and preliminary analysis was carried out in the GIS domain. A presentation on the project made by the researcher during the Annual Research Seminar was one of those awarded.

*** 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), which is among the least disturbed protected areas in the country, was declared a biosphere reserve in 1988 with a view to conserving a crucial Himalayan ecosystem. There are 15 villages located in the buffer zone of the reserve. This project aims to quantify the dependency and biotic pressures of the people in these villages on the natural resources of the biosphere reserve. It will also investigate the socio-economic and cultural status of the villagers, identify hindrances preventing acceptance of ecologically sustainable alternatives, and suggest strategies for the sustainable utilization of natural resources in the reserve's buffer zone.

Questionnaire survey in a village around Nanda Devi

A detailed socio-economic study of the villages was completed last year. This year, work has been done on quantification of biotic pressure and data has been collected on biomass production and consumption pattern. Biotic pressure on the buffer zone was quantified by taking two broad parameters - wood cutting and livestock grazing pressure and assessed by laying transects radiating from the boundary of each village towards the forest up to a point where no pressure was recorded. The number of cattle seen, dung piles, grazing and browsing signs, percent ground cover and grass height were the parameters recorded for the quantification of grazing pressure. Simultaneously, wildlife evidences were also recorded.

Sheep and goat grazing is seasonal and restricted to the higher altitudes. Three major sites were selected - Malari (3870 mts), Dunagiri (3890 mts) and Lata Kharak (3770 mts) - where the grazing impact was studied in both controlled and uncontrolled situations. The controlled situation was created by fencing six plots of 10 x 10 mts each - two plots each at the three sites using barbed wire and iron poles, while the location outside the fenced plots was considered as uncontrolled. The clipping method is being followed to study the biomass production in two situations.

Agricultural biomass production was studied by collecting the samples of different crops from 50 x 50 cm quadrats at the time of harvesting. The collected samples were sorted into different parts such as leaves, stems, pods, tubers and seeds, and the dry biomass of each part was recorded.

The per capita firewood consumption is currently under investigation. To study the consumption pattern, the villages have been clustered into three groups *i e.*, 1) distantly migrating villages; 2) locally migrating villages;and 3) permanent villages. One village each from the three groups was selected - Dunagiri, Lata and Reni for the study. Observations so far reveal that there is a continuum of wood cutting pressure up to a maximum of 2 km, and livestock grazing pressure is restricted to 1-1.5 km from the village boundary. Villages located at higher altitudes normally collect fallen wood but here the lopping pressure was intense

due to migrating sheep and goats which feed on the lopped *Betula utilis*. The data collected, however, have yet to be analyzed.

Further study on these aspects, particularly in the Kumaon part of the study area would be carried out next year.

*** Ecological study of montane grasslands in the Valley of Flowers and Eravikulam national parks.**

Faculty : Dr GS Rawat
Researchers: CP Kala and *PV Karunakaran*

The temperate and tropical montane grasslands of India, located in the mid-elevations of the Himalaya (1800-3500 mts msl) and the Nilgiri (>2000 mts msl) occur in different biogeographic zones, exhibit ecological differences but also have some commonalities. Each has a high level of endemism, yet there are also similarities in flora and fauna such as the occurrence of plant and animal species like the rhododendron and the tahr. The mosaic of factors that helps these grasslands remain stable and functional calls for a closer evaluation, and their great human use value (including the human pressure) necessitates their conservation. However, their conservation planning suffers from lack of adequate information and precise quantitative data on structural and functional attributes of these grasslands.

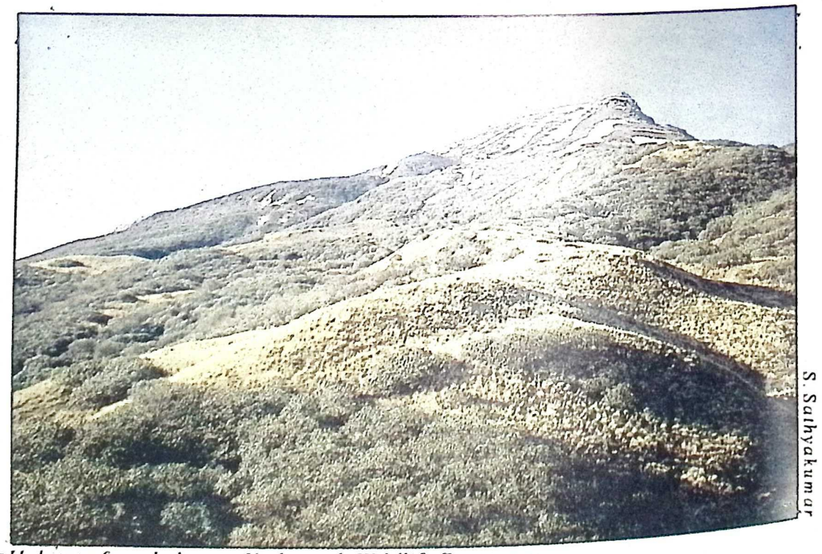
This project was started in 1992 and the two representative sites selected for detailed investigations are the Valley of Flowers national park and surrounds (Garhwal Himalaya), and Eravikulam national park in the high ranges of Western Ghats (Kerala). The aim of the study is to collect basic ecological information, prepare floristic inventory, study community structure, composition, biomass productivity and successional trends, study the animal use patterns and their impact on vegetation, and the management problems so as to evolve comprehensive conservation plans for the high altitude grasslands of the western Himalaya and Nilgiri.

During the reporting period data were collected on the phenology of various species, biomass productivity in various habitats, response to fire and livestock grazing in the outer fringes of both the parks. With this, field work in both the areas has been completed. Also, during the year, data on the plant community composition have been analyzed for both the areas using the TWINSPAN (Two Way Indicator Species Analysis) programme. Identification of plant species from various micro-habitats, data analysis on species diversity, phenology, biomass distribution for both the areas are over. Now report writing is in progress. Three research papers, based on the study, have been communicated to various journals/monographs for publication.

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

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

The Himalayan musk deer was once distributed all along the southern side of the Greater Himalaya between 2500 mts



S. Sathyakumar

Habitat of musk deer in Kedarnath Wildlife Sanctuary

and the 'treeline'. Poaching for "musk" and large scale destruction of its habitat have led to a decline in its population and restricted its distribution to isolated pockets.

In view of this, UP state forest department started a Captive Breeding Centre for this species at Kanchulakharak, near Kedarnath wildlife sanctuary. This project was taken up in June 1994 with the view to conduct studies on the captive musk deer at this centre, leading to the reintroduction of a few individuals in an area where the species had become locally extinct in the recent past.

During the period under reporting, some of the carry over pre-release actions from last year and preparations for the release phase were carried out. Habitat evaluation studies of the control and release sites are in progress. Quantification of food availability including lichen and moss estimation at both sites are being carried out for different seasons. Health investigations on the captive musk deer at the Breeding Centre, which included standardization of immobilization procedures, collection of blood samples, laboratory analysis of serum samples, histopathology and parasitology were conducted. Further investigations on these aspects are in progress. Designing and construction of transportation cages, and practising radio telemetry in the study area are in progress. In the coming year, enclosures will be constructed at the release site, followed by the actual release of some captive musk deer and their radio monitoring thereafter.

*** Sero-epidemiological surveillance of infectious diseases of wild ungulates in Sariska tiger reserve.**

Faculty : Dr Pradeep K Malik
Researcher : Dr Pravin K Malik

Restriction of wildlife to small geographic patches of protected areas have given rise to epizootic and enzootic disease possibilities. Also, agricultural development has brought domestic and wild animals together to share common grazing grounds. Being mutually prone to infections, the interaction between wild and domestic animals have resulted in highly contagious and fatal viral and bacterial disease outbreaks in the last several decades. However, much of these have gone unrecorded.

In fact, the study of wildlife diseases and the practice of wildlife health management are new disciplines in India. While the ecological and biological aspects of the ecosystem and wildlife have been widely studied, there is little knowledge and appreciation of wildlife health aspects, particularly the role of highly contagious and fatal viral and bacterial diseases in wildlife population dynamics. Some of these diseases affect a wide range of animal species over large areas and cause heavy mortality and morbidity in wild populations.

This research project is being conducted in Sariska tiger reserve, Rajasthan with the objective of defining the presence or absence of certain diseases in wild ungulates, the extent and role of these diseases in population dynamics of wild species, and their possible relationship with domestic livestock. The study will seek to establish a basic database of physiological reference values for both disease free and affected animals. On the basis of the findings of the study, WII would be able to suggest health management guidelines and strategies for the control and prevention of these diseases in Sariska. Being the first systematic study of its kind in India, it will also serve as a model for health management of the ungulates in other wildlife areas of the country.

After the establishment of the base laboratory last year, work on collection of blood, nasal and rectal swab and faecal samples from wildlife as well domestic livestock - buffaloes and goats from inside and on the periphery of the reserve - was started. During the year under reporting, this has continued. Also, the samples have been analyzed in the base laboratory as well as in specialized laboratories at Haryana Agricultural University (Hissar, Haryana), IVRI (Izzatnagar, Uttar Pradesh) and GB Pant University of Agriculture and Technology (Pantnagar, Uttar Pradesh).

Haematological and biochemical results of sambar samples are being processed for statistical analysis. The faecal pellets

are being examined for endoparasitic eggs or larvae. Bacterial culturing from rectal swabs from apparently healthy sambar have revealed presence of *Escherichia coli* in nine cases. This was considered a normal flora of the gut but some of these are found to be pathogenic to mice. The findings indicate that the organism can be an opportunist and can lead to disease conditions in an animal under stress. Results of the serological tests are awaited.

*** Behavioural ecology of caracal in Sariska tiger reserve, Rajasthan**

Faculty : Dr SP Goyal
Researcher : Shomita Mukherjee

India has the highest diversity of cats in the world, having 15 out of the 37 extant felid species found worldwide. However, between the larger and the smaller cats only the former have been studied to some extent while the latter have largely remained ignored. Today, all the small cats in India, with the exception of the jungle cat, are threatened or endangered. The caracal is one such species which needs urgent conservation attention.

Shomita Mukherjee

Jungle Cat a co-predator in caracal habitat

Caracal was once distributed widely in India. But in the last few decades, a drastic reduction in its population has made its survival uncertain. Poaching for its pelt, changes in landuse patterns due to rise in human population and uncontrolled expansion of agriculture in arid tracts have greatly fragmented the caracal habitat so much so that the animal is now found in isolated, patchy pockets.

This study is aimed at collecting information on the ecology and behaviour of caracal and its co-predators like the jungle cat and jackal in Sariska tiger reserve, and identifying crucial habitats in its range. After completion of initial reconnaissance of the study area where various field methods were tested for studying the relative abundance and habitat use, analysis of the preliminary vegetation data and scat analysis for diet estimation, work on capturing caracal, jungle cat and jackal for radio collaring was initiated.

Five clover traps baited with cat lure, meat and fish were set up in the intensive study site. In June 1995, a female jungle cat was trapped and tranquillized using 1 ml ketamine hydrochloride (50mg) and 0.1ml xylazine hydrochloride (5mg) administered intra-muscularly. A transmitter with an activity sensor weighing 150 gm was then fitted on its neck and then it was monitored closely over the next three months. Results of tracking over 6 diet cycles, tracked every 4 hours show that the cat was exclusively nocturnal, moved over an area of < 1 sq. km, using open scrubland for hunting, and had three specific resting sites in dense scrubland. Resting sites were located in dense *Zizyphus mauritiana* and *Adhatoda vasica* bushes close to the road (10m-75m). The transmitter stopped functioning after the monsoon.

Rodent abundance was measured using Sherman live traps in five habitat types (open scrub, dense scrub, hill forests, grassland and mosaic). There were 840 trap nights set for each habitat during winters. Three species of rodents were captured viz. *Tatera indica, Golunda elliotii* and *Mus platythrix*. *T.indica* was most abundant in the grassland and dense scrub while *M. platythrix* was more

common in the open scrub. *G. elliotii* was captured from the grassland. No captures were obtained from the hill forests. More than 1000 scats samples have been collected and their analysis is in progress.

*** Establishing geographical information system (GIS) database for management of Gir protected area (GPA), Gujarat.**

Faculty :Dr AJT Johnsingh, Qamar Qureshi and Dr VB Mathur
Researcher : Diwakar Sharma

Gir has been the only refuge of the last remaining population of about 250 Asiatic lions. Over the years, it has attracted numerous researchers to study its physiography, geology, vegetation, ungulates and lion ecology, which have significantly advanced our knowledge on the Gir habitat and its larger vertebrates. However, much of this biological information is scattered, isolatory and not available is any homogenised form.

Diwakar Sharma

Teak-Acacia-Zizyphus woodland in Gir

There is an urgent need to synthesize all available information so that the findings and recommendations from these various studies can be used and implemented effectively by managers. This can be done by creating an integrated park level database using GIS database. The GIS database, with its ability to correlate various factors affecting vegetation and animals distribution, will help assess the future impact of biotic pressures and management practices on the basis of existing field data, spatial data and simulated data. The park level database can be updated easily as new information comes in.

This short-term project started last year and located in Gir protected area (GPA) which includes the wildlife sanctuary (1154 sq km) and national park (258 sq km), seeks to generate synthesized information on habitat manipulation, fire, grass and water management. A draft vegetation map based on supervised classification of IRS LISS II digital data has been prepared which provides eight vegetation categories of the 15 classified previously. This reduction in number is because some vegetation types are in inconsequential small patches or have the same tone and texture as comparable to those on the map. Water availability and localities burnt in 1989 and 1993 summers have also been mapped. A digital terrain model has also been prepared.

Further analysis and report writing are in progress.

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

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

Singhbhum forests in the Chotanagpur plateau in south Bihar encompass major elephant habitat and elephant population in the state. The sal forests in Saranda forest division here are one of the finest in the country. However, in the absence of any protected area, and because of improper landuse including heavy mining, illegal felling and hunting, these forests are fast losing their floral and faunal values. As a result, elephants can now been seen moving over long distance from Singhbhum to Madhya Pradesh, leading to increasing man-elephant conflict. This study basically aims

R. K. Singh

Air pollution around Singhbhum forests

categorized into five distinct zones of pollution - upstream clean water zone (7.8 km), zone of recent pollution (0.5 km), septic zone (30.6 km), recovery zone (3.6 km) and downstream clean water zone (41.5 km). There were 15 stations along the river which were monitored for the presence of Cr, Cu, Fe, Pb, Mn and Zn. The septic zone was found to have low dissolved oxygen and high total suspended solids. Also, the Fe, Cu and Mn concentrations here were found to be high and over the permissible limits. The river is also being monitored for its biological contents.

to find the effects of habitat fragmentation and of iron-ore mining on the elephant populations and habitats.

During 1995-96, further to last year's work, the elephant habitat in Singhbhum was categorised and quantified for both forest and non-forest areas by using IRS FCC (LISS II) images, thematic maps and Survey of India toposheets. The forest areas were further classified into seven major vegetation types. Forest patches (total 992) were identified in GIS regime using CLUMP command. Of these, 94 % (975) of the patches were less than 5 sq km, together covering only 8 % of the elephant habitat. 13 patches were 4-45 sq km (covering 7.2% habitat), one patch of 45-80 sq km (3%), one patch of 80-200 sq km (7.5%) and two patches 200-8-- sq km (74.3%). Data is being collected on habitat, animal and biotic factors from proportionately laid transects on four patch categories. This will provide information on variance of elephant occupance, utilization and preference structure in fragmented and unfragmented habitats.

On the other aspect of the study, the water in river Koina has been analysed and on basis of this, the river has been

*** Effect of shifting cultivation on the ecology and conservation of mammals with special reference to T. Phayrei in north-east India.**

Faculty : SK Mukherjee
Researcher : AK Gupta, IFS

The field work in the project was completed last year where Gupta studied the effect of habitat fragmentation due to *jhum* agriculture practice in Tripura on the ecology and conservation of primates, particularly T. Phayrei. The data analysis work is now in progress. The preliminary analysis of the ecological data on primates and socio-economic data on human populations does indicate the existence of a very intricate human animal inter-dependence for the common resource base in the study area. From the final analyses and findings, we may be able to deduce some positive mitigatory strategies for the conservation of such species in the area.

Having completed the field work, Gupta left for University of Cambridge (UK) where he has registered for the Ph.D.

*** Responses of arboreal mammals to selective logging in Arunachal Pradesh**

Faculty : Dr SP Goyal
Researcher : Aparajita Dutta

The survival of many arboreal species depends on their ability to co-exist with some level of timber extraction. However, arboreal mammals such as primates and squirrels are vulnerable to logging as it creates gaps in the canopy and results in loss of food and nest trees. This short-term study in Pakhui wildlife sanctuary and adjacent reserved forests in Arunachal Pradesh aims to determine the vegetation composition and structure and the impact of selective logging on primates and squirrels.

Aparajita Dutta

Logging operations in reserve forests in western Arunachal Pradesh

Abundance of squirrel and primate species were compared between recently logged forests, a 20-25 year old logged forest, semi-disturbed forests, plantations and unlogged primary forests. Four diurnal squirrel species were recorded - Himalayan striped squirrel, the hoary-bellied Himalayan squirrel, the red-bellied Pallas squirrel and the Malayan giant squirrel. The primate species recorded were the capped langur, Assamese macaque and the rhesus macaque. Night censuses for flying squirrels were carried out on elephant back. Vegetation structure, species composition and canopy continuity of the logged and unlogged forests were determined and more than 100 plant species were identified. Individuals of 5-10 species were tagged for phenological observations for comparisons of fruit availability between logged and unlogged areas.

Data is being analysed and the results of the study will be useful in identifying arboreal species which are vulnerable to habitat modification, and in determining the compatibility of current logging levels with the conservation of primates and squirrels.

*** 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

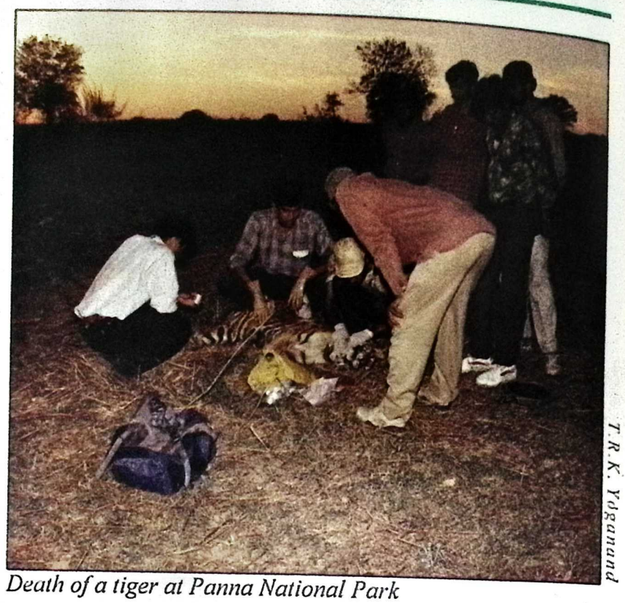
Of the four sea turtle species found in the coastal water of Orissa, only the Olive Ridley is known to nest. There are three mass nesting beaches (or rookeries) - Gahirmatha (the world' largest known), Devi and Rushikulya which was discovered during WII's survey project two years ago. That survey resulted in this project on a detailed ecological analysis of critical sea turtle habitats along the coast. The objective of the study is to develop a scientific management action plan to ensure the long-term survival of sea turtle that still nest in thousands at some selected beaches along the Orissa coast. The action plan would encompass nesting habitat protection and management strategies, habitat restoration plans, avenues for future scientific research and development of public awareness programmes.

The field work is now in progress. An intensive study is being carried out at Gahirmatha and Rushikulya rookeries. A new method (fixed strip nesting turtle count) has been standardized during the last two nesting seasons to enumerate

the number of turtles nesting. Using this method, about 350,000 and 130,000 nesting turtles were counted at Gahirmatha and Rushikulya respectively during the 1995-96 nesting season.

It is planned to tag nesting sea turtles at the two rookeries to study their dispersal in the coastal waters of Orissa. It would help provide data on sea turtle population size and characteristics, migratory paths and geographical ranges, feeding areas, breeding frequency, inter-nesting interval, nest site fixity, growth rate, etc. It would also enable us to determine whether the turtles at the two sites are the same (which disperse from Gahirmatha to nest in Rushikulya or vice versa) or different populations, as nesting at the two sites does not take place simultaneously. About 35,000 monel metal tags are being procured with funding support from NORAD through the MS Swaminathan Research Foundation, Madras. Part of these would be used during the coming season at Gahirmatha, Rushikulya and four other locations along the Orissa coast.

The research project is also documenting the changes in nesting beach profile and its impact on sea turtle nesting. Regular annual surveys along Orissa coast have shown a high mortality of adult sea turtles that accidently get caught in fishing nets. Artificial lighting near important sea turtle nesting beaches and its impact on nesting sea turtles as well as the turtle hatchlings is now being looked into.



T.R.K. Yoganand

Death of a tiger at Panna National Park

Projects Initiated

*** Ecology of tigers in Panna national park, Madhya Pradesh.**

Faculty : Dr RS Chundawat
Researcher : Neel Gogate

Despite the early success of Project Tiger in conserving the tiger and its associated fauna and flora, the tiger population in India has been again on a down-slide in the last few years. This has necessitated looking into the problem afresh. This study on the ecology of tigers has been initiated with the aim of making a realistic projection of the requirements needed to maintain a demographically viable population of tiger. The project will study the tiger's (1) feeding ecology to determine a tiger's prey requirement and the minimum size of a protected area required to sustain a demographically viable population of tigers so that the potential of India's PA network for conserving tigers and their habitat can be predicted; (2) habitat utilization to predict patterns of habitat selection so as to target special management programmes for crucial tiger habitats; and (3) home ranges and movement patterns which would be necessary in managing a large carnivore population.

The field work started in January 1996 and for the next two months preliminary studies were conducted to identify tigers for radio-collaring. Several census counts were conducted to get information on prey distribution and abundance. The intensive study would be conducted in Hinauta range (approx 100 sq km). Six adult tigers have been identified. Their movements were monitored by following their tracks, and it is observed that they are using an area of 70-100 sq km. This enabled the research team to target the particular tiger intended for radio-collaring.

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

K. Sankar

Gaur in Teak forest in Pench Tiger Reserve

The study, initiated in February 1996, 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. GIS will be used to map the resource distribution and its management in the tiger reserve. Models will be made to identify areas that are likely to be fire prone, have intense human pressure, biodiversity values, and critical habitats for species of conservation importance. This study envisages capturing 30 gaurs for the collection of tissue and blood samples. Eighteen of these animals will be radio-collared.

*** Conservation status of high altitude forests in Garhwal Himalaya, Uttar Pradesh.**

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

This project was initiated in April 1995. The objectives are to: (i) conduct status survey of rare, endangered and endemic plants in the Bhagirathi catchment of Garhwal Himalaya, (ii) study the structure and composition of forests along the altitudinal and human use gradients, (iii) study 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.

In the initial, reconnaissance phase of the project, general inventories were made of birds, mammals and plants in various forest patches. Methodologies for vegetation sampling were tested. A detailed survey of *Taxus baccata* was conducted and the results were presented at the Annual Research Seminar 1995. Junior researchers were appointed in December 1995 and put through an orientation programme in wildlife conservation. They did a detailed literature review on various aspects of the study, following which the work programme and data sheets were designed. The study area map has been digitized using GIS which will be updated as and when data is collected and analyzed. Extensive field work started in February-March 1996.

*** A preliminary study on the ecology of the leopard in Sanjay Gandhi national park, Maharashtra**

Faculty : Dr. Ravi Chellam
Researcher : Advait Edgaonkar

Sanjay Gandhi national park is part of the sprawling Mumbai city. It is remarkable that a large carnivore like the leopard is able to survive in such close proximity to a densely populated metropolis, and that too in a small and isolated forest habitat. This study hopes to generate data on the basic ecological parameters pertaining to the leopard and throw some light on the pattern of the leopard-human conflict prevailing here. In particular, the study would (1) determine

the diet of leopards in the park; (2) estimate the relative abundance of potential prey in selected areas in the park; (3) relate vegetation, human disturbance and prey abundance to the intensity of habitat use by leopards; and (4) investigate spatial and temporal patterns in the instances of leopard-human conflict in the park. The field work of this short term project began in December 1995.

*** Estimation of relative abundance of carnivores using camera traps in Melghat tiger reserve, Madhya Pradesh.**

Faculty : Dr AJT Johnsingh
Researcher : Prachi Mehta

Photo census is a relatively new method used for recording the presence, abundance and identification of individual carnivores. Camera traps have been used in surveys for elusive carnivores like the Malabar civet (*Vivera civettina*) and clouded leopard (*Neofelis nebulosa*). A short term project using camera traps triggered by pressure pads to estimate the relative abundance of tiger (*Panthera tigris*) and leopard (*P.pardus*) has now been taken up in Melghat tiger reserve since November 1995.

The study is being conducted in the core area and the tourism zone of the reserve. In addition to camera traps, track plots are also being maintained to identify the spoor and estimate the index of the use of carnivores.

The study would provide information on the relative abundance of tiger and leopard for the two study sites. This information could be compared with the existing data on tiger and leopard abundance based on pugmark census. Information would be gathered on the presence and relative abundance data for other low density and elusive carnivores as well. The study will also enable the reserve staff to get oriented and trained in this new method for carnivore abundance estimation.

The report of the study is expected to be ready by October 1996.

COLLABORATIVE PROJECTS

World Bank

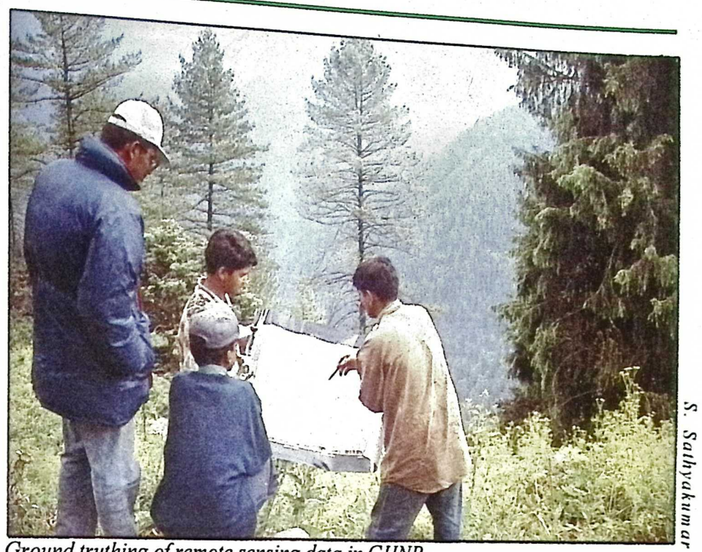
*** An ecological study of Kalakad-Mundanthurai tiger reserve : An ecodevelopment approach.**

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

In the last few years, there has been a definite shift in the concept and approach to wildlife conservation. It no longer means providing exclusive protection to specific flora or fauna, nor adopting a restrictive policeman's approach to providing protection. Wildlife conservation today is seen more holistically and means providing protection to the entire biodiversity within and around a given protected area. More importantly, it includes a concern for the people living in the surrounds of the protected areas in the belief that an improvement in the living and economic conditions of such people would lead to the betterment of the wilderness areas. Toward this, the World Bank has a Forest Research Education and Extension Project (FREEP) and as part of this Kalakad-Mundanthurai tiger reserve has been accorded an ecodevelopment programme. WII, identified as the nodal agency for conducting research on conservation of biodiversity under the FREEP, has accordingly initiated this research, the findings of which would effectively help in formulating ecodevelopment programmes for the people living in close vicinity of the tiger reserve.

The Kalakad-Mundanthurai tiger reserve is truly rich in terms of sheer diversity of habitats in that it harbours at least seven different forest types. The altitudinal variation ranges from the sea level to 1800 mts above msl. The reserve is home to five of the eighteen Indian primate species, the rare blue-finned mahaseer and the Nilgiri tahr besides a host of large and small cats.

WII's multi-disciplinary research spans subjects such as botany, ethnobotany, socio-economics, management, etc. The study will make a detailed inventory of the flora and fauna of the reserve which has hitherto been only sporadically documented. It will do a detailed study of the slender loris, the main prosimian here, so as to prescribe management guidelines particularly for the buffer zone. The study also seeks to look at the medicinal plants in the reserve, study their use by Kani tribals and conduct a survey on the extent of their prevalence in the market. This would help in suggesting the cultivation of preferable herbs by the locals.



S. Sathyakumar

Ground truthing of remote sensing data in GHNP

Socio-economics, being the bulwark of ecodevelopment measures, form a major part of the study. Surveys would be conducted in about 66 villages to gauge their forest dependence and attitude to conservation, and thereby develop potential income generating activities. Study will also be done to find out the impact of resource use on the structure and composition of the vegetation, which would enable proper management and planning plant conservation strategies for the future.

The research team is based at Mundanthurai and have started its work. However, no funds have as yet been received.

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

Faculty : Sanjeeva Pandey, 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 FREEP in which WII is the nodal agency, carrying out research and monitoring in Great Himalayan national park (GHNP), Himachal Pradesh, as part of the ecodevelopment programme of the HP Department of Forest Farming and Conservation.

GHNP, located at the junction of two great faunal realms - Palaearctic and Oriental, in Kullu district of Himachal Pradesh, covers the catchment area of upper Beas river in four valleys of Parbati, Jiwa, Sainj and Tirthan. It is representative of the western Himalayan flora and fauna, supporting several endangered mammals and pheasants such as musk deer, serow, brown bear, blue sheep, western tragopan, chir pheasant and monal. It is one of only two national parks in the world to support a population of endangered western tragopan. The plant communities are representative of temperate and alpine regions and consist of high altitude mixed forests, sub-alpine and alpine pastures.

Although human population exists only on the western and north-western boundaries of the park, it depends upon the resources of the park. There are two small villages located inside the park, while the people living on the western boundary claim traditional grazing rights as well as rights of herb collection in the park. About 2500 people collect herbs and mushrooms. An estimated 35,000 sheep and goats graze in the park during the summer months.

This seeming conflict between the interests of biodiversity conservation and of the people living close by, necessitates developing area-specific management guidelines for conservation of biodiversity taking into account the forestry objectives and the needs of the local people. However, there is a lack of adequate information available on GHNP. Although a management plan exists for it, and an indicative plan for areas adjacent to the park, scientific information is available only on the birds and large mammals, and that too for only parts of the park. No work has yet been done on the species diversity of plants, invertebrates, reptiles and amphibians and small mammals. Neither is information available on the effect of biotic pressures and other resource use by the local people and livestock grazing either directly on wildlife or on the habitats of endangered and endemic species. All such baseline information, including that on physical factors affecting ecological community structure and distribution and on the ecological relations among key species (large herbivores, predators) is necessary in order to plan an effective scientific management of the area's biodiversity and help plan the sustainable use of the resources by the local people.

In view of this, this project has been initiated in GHNP with the specific objectives to - (i) study its biodiversity and establish baseline data on its floral and faunal attributes; (ii) study the impact of livestock grazing, herb collection and other human activities on the biodiversity, and suggest ecodevelopment alternatives to mitigate these pressures; (iii) study the socio- economic aspects and anthropological issues involving people currently dependent on the park; and (iv) 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.

A team of eight researchers has been employed for this multi-faceted study which would be conducted in an inter-disciplinary manner.

US-FWS (PHASE I)

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

Faculty: Dr AJT Johnsingh, Dr GS Rawat and Dr PK Malik
Foreign collaborator: Dr Michael Stuwe, Smithsonian Institution, USA
Researchers: Nima Manjreker and Yash Veer Bhatnagar

The project was initiated in 1991 in collaboration with the Smithsonian Institution, USA. Stuwe, who has studied the Alpine ibex in Switzerland and Nubian ibex in Israel, suggested this project to study the genetics and ecology of the Himalayan ibex and compare it with the findings from the other two studies.

G. S. Rawat

Vegetation study by Researchers in Pin Valley National Park

Information on these aspects will be of importance in developing suitable conservation and management practices for the high altitude areas in general and the Himalayan ibex in particular. The research site is Pin Valley national park which is a trans-Himalayan, cold desert area lying between 3600 mts and 6632 mts above msl, with temperatures ranging between -35°C and +35°C.

Last year, seven ibex were radio-collared - perhaps the most successful capture and marking event in India. These were tracked by Bhatnagar till June 1995 and then by two trained field assistants till November 1995. During this, data on home range and habitat use by ibex was collected. Data on resident livestock has also been collected to understand the ecological separation between ibex and the livestock. The adjoining Kibber wildlife sanctuary, which has both bharal (*Pseudois nayaur*) and ibex, was surveyed in August 1995 to quantify differences in the habitat of these two ungulates.

Satellite images were procured from National Remote Sensing Agency, Hyderabad in August 1995 and ground truthing was done later that month.

Manjreker who was looking into the vegetational aspects in the study area, completed nutritional analysis of plant samples at the WII research laboratory. Both researchers are now in advanced stages of analysing their data. In between, Bhatnagar participated in the XV Indian Scientific Expedition to Antarctica.

The project had been granted a two-year extension and is now expected to end by March 1997.

*** Ecology of the Indian giant squirrel**

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

A survey of Malabar giant squirrel habitats was carried out in Maharashtra, Gujarat, Goa, Karnataka, Madhya Pradesh, Andhra Pradesh and Tamil Nadu between January 1992 and October 1993. The present study is a follow-up on that survey. It started in November 1993, also involves the BNHS, Bombay, and is located in Bhimashankar wildlife sanctuary (Maharashtra) which has a good squirrel population free from poaching pressures. The core study area (5 sq km), spanning the valley of the Bhima river, is the sacred grove of the Bhimashankar temple.

The objectives of the study are to investigate the food selection and ranging patterns of the Malabar giant squirrel and examine the relationship between food availability and the animal's reproductive success, which would help in developing a management plan for its conservation.

During the year under reporting, field work and data collection on the social behaviour and feeding ecology of the Indian giant squirrel continued till the end of January 1996. At present, data is being collected on the community-level phenology of the trees and liana in the core study area. The phenology of three satellite forest areas has also been monitored.

The field work is expected to get completed soon.

*** Conservation of the Indian wolf**

Faculty : Dr YV Jhala

The wolf, a sub-species of the grey wolf and a major predator in the grassland-scrubland habitats in India, is on the endangered list of the Indian fauna and on Schedule I of CITES. The species is, however, yet to receive attention in the form of detailed scientific studies or conservation efforts. From the limited studies conducted so far on the wolf, it is clear that it can be effectively conserved provided efforts begin soon.

This research project aims to provide insight into the basic parameters of wolf ecology so as to aid in the formulation 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 from two packs was collected during 1995-96. Data has also been collected on food habits, prey populations, prey-predator relationships, and human-wolf conflicts. Field work was commenced at a second site in Kutch with the help of Earthwatch volunteers. Basic surveys and prey estimates were done during November 1995, and it is hoped that wolves would be radio-collared at this site by the end 1996.

A significant outcome of the field work so far has been the identification of a major cause of wolf mortality in the Bhal area of Gujarat. Most wolf deaths during the pup and juvenile ages were caused by canine distemper, which has prevented any recruitment in one of the study packs for the past two breeding seasons. The disease is spread by feral dogs which are abundant in the study area.

Funds for the study so far have been obtained from the National Geographic Society, Centre for Field Research (Earthwatch), National Fish and Wildlife Foundation and the Conservation Treaty Support Fund. With a major grant from the US Fish and Wildlife Service through US-India Fund coming through, it would be possible to start field work at the other intensive research sites.

US-FWS (PHASE II)

Following the completion of Phase I of the WII-USFWS collaborative project, supported by US-India Fund under the Indo-US sub-commissions on science and technology, WII signed a joint agreement with USFWS in June 1995 for carrying out several new research projects during 1996-2000. Under this Phase II, six new research projects were initiated in January 1996. The details of this for the year 1995-96 are as under :

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

Faculty : Dr SP Goyal and SK Mukherjee
Researcher : Dr Archna S Kumar and Nickey 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 enforced improperly, particularly when the biological materials caught with the culprits are often in the form of blood stains, a few hair samples, small pieces of meat and bones or as a highly processed product which cannot be identified just on the basis of morphological characteristics. These evidences can be identified using forensic techniques but in India forensic laboratories have not paid attention to wildlife related offences, and investigative and analytical procedures related to wildlife have not been developed. Also, there is lack of reference material and methods necessary to identify the species nor have any systematic studies been done to standardize these techniques.

WII itself has been receiving confiscated samples from time to time from various state forest departments for identification of the animal species. While hair samples can be identified, it has generally been difficult in the case of other samples. WII had conducted a project to standardize forensic techniques and strengthen its laboratory's capabilities in identifying species from biological samples. This has since been done and the project was completed last year. On the gains of that research, a project has now been initiated to develop this facility at WII, including developing identification procedures and collecting a body of reference material for the vertebrate species, so as to support law enforcement in wildlife conservation effort. The project would enable close linkages with national and international institutions in wildlife forensic technology, and help prepare a perspective plan for the development of wildlife forensic technology in India.

To identify the extent of pressure on wildlife species affected

by illegal trade, about 300 entries have been made in the database from the information published in dailies and the newsletters of various organisations and through questionnaire mailed to national parks and sanctuaries. Another questionnaire is being prepared to gather information on reference material such as skins, bones, hair, feather and whole specimen, available with various organisations.

Work has been initiated to identify species based on morphological characteristics and biochemical analyses. For identifying species from tissue samples, it is proposed to use electrophoresis and modern spectroscopic techniques. One of the researchers has undertaken a training in the use of electrophoresis technique at the Biotechnology Department, Roorkee University. Thin layer chromatography for lipid analysis of five domestic animal species is in progress so as to observe differences in the fatty acid profile. For this, WII is interacting with the National Forensic Laboratories where samples have been sent for Gas Chromatographic analysis to aid in identification of fatty acid profiles.

*** Identifying potential areas for conserving biodiversity in the Indian Himalaya.**

Faculty : Dr RS Chundawat, Qamar Qureshi and Dr VB Mathur
Researcher : Rashid Raza

The Indian Himalaya is among the most actively degraded ecosystems, and not adequately represented in the country's protected area network. However, pinpointing the gaps in the network, identifying where and how much land to put under protective status is not an easy task. Resource managers here don't always have a clear picture on what resource should be protected and how much area is adequate. Field studies in the high Himalaya present the researchers with some of the most physically arduous and harsh working conditions in the world. In these mountains that span more than 2400 km, it is difficult and expensive to conduct massive surveys of biodiversity. In such case, GIS and satellite remote sensing offer hope in broadly assessing biodiversity but then GIS is still largely untested in the Indian Himalaya and satellite imagery has its limits in high relief, rocky and often snow-covered terrain.

This study seeks to help resource managers identify gaps in the protected area network in the Himalaya, using GIS and remote sensing technology in tandem with targeted field studies. The objectives of the study are to - 1) build a biodiversity model from targeted surveys of vegetation and mammals in two selected national parks in western Himalaya; (2) apply the biodiversity 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.

So far, only one researcher has been appointed who is currently doing a literature survey.

*** The relationships among large herbivores, habitat and humans in Rajaji-Corbett national parks, Uttar Pradesh.**

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

Conservation of biodiversity is a high priority in India where 4.5% of the land is covered as protected area. But the protected areas are themselves facing problems - those arising from a fast expanding human population or through human induced disturbances causing degradation of habitat and decimation of flora and fauna. The Shivalik hill range stretching from Jammu in the north-west to Bengal in the east, is one such wilderness area facing increasing biotic pressures.

The Shivaliks cover a total area of 40,000 sq km, but it is only the area lying between Yamuna and Kosi rivers in Uttar Pradesh which is home to abundant wildlife. This stretch also has two well known protected areas - Rajaji national park (830 sq km) and Corbett tiger reserve (1400 sq km) - which have strengthened conservation in this north-western

A. Christy Williams

Elephant in the corridor between Rajaji and Corbett

home of the elephant and tiger. These areas support 100-150 tigers, > 300 leopards and 90% of the 750 elephants in Uttar Pradesh. However, the Rajaji-Corbett area faces two major problems - it has been almost fragmented into three areas by developmental projects (i.e. Ramganga reservoir and Chilla power channel), and is under severe biotic pressures by people living within and outside the forests.

This project aims to prepare habitat maps of varying quality for the herbivores, using remote sensing; quantify vegetation composition and structure within each habitat; study the distribution and abundance of goral, chital, sambar, barking deer and nilgai; do an intensive study on habitat use and ranging pattern of goral and elephant, using radio telemetry; and quantify the impact of people living nearby and their livestock on the habitat.

The project was started in Rajaji sanctuary (300 sq km) in October 1995. At present only one researcher has joined and is determining the distribution pattern of elephants, estimating their densities and quantifying biotic pressures to establish grades of habitat based on disturbance (light, moderate and high). Later, radio telemetry will be used to get precise information on the ranging patterns of elephants. Three more researchers are likely to join the project.

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

Faculty : Dr AJT Johnsingh, HS Pabla and Dr CG Rice
Researcher : TRK Yoganand

The sloth bear *(Melursus ursinus)* is a widely distributed large carnivore of the Indian subcontinent, yet little is known of its ecology and behaviour. This study in Panna national park, the first such study in India, will improve our knowledge on the species, and the information would establish a basis for its conservation. The study will collect data on the ranging habitat-use, food habits and social behaviour of sloth bear through standard techniques of radio-tracking and direct observation. The range use of the different radio tagged bears would be related to resource availability, social status of the animal and the level of human disturbance within their range.

Panna national park is located in Madhya Pradesh where the major forest type is dry deciduous, considered optimum sloth bear habitat. There are ample evidences of good sloth bear population here. The relatively flat terrain and relatively uniform vegetation type of the study area would allow to compare between the range use of the different radio tagged bears. This would also help to provide control for other factors affecting range use and thus assess the impact of human disturbance on various aspects of the ecology of bears.

The project commenced in January 1996. The field work was started in February. Initial work focused on surveying the various habitat types, understanding bear movements, testing different baits and selecting an intensive study site. The researcher was trained in capture and immobilization techniques. Trapping was initiated in mid-February. Foot snares, barrel (culvert) traps and darting free ranging bears from elephant back were the three methods tried to capture bears.

Until end of March 1996 about 350 trap-nights were run. One bear, a prime adult male (about 150 kg) was trapped

and radio-collared during this period. The bear was immobilized with a dissociative anaesthetic drug 'Telazol'.

Trapping is being continued to radio-collar more bears. A minimum of 20 bears are planned to be radio-collared for this study. Locations of the animals will be obtained by homing in on them and by triangulation method. Associated studies on the vegetation community, phenology, feeding habits and human impacts on habitat will be made.

*** 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 Muddappa, NM Ishwar

The rainforests of the Western Ghats are concentrated centres of biodiversity particularly of amphibians, reptiles and small mammals. But nearly a century of human activities in this area have removed vast areas of rainforests, rendering the remaining to severe fragmentation. Although habitat loss has been somewhat stemmed with the existing rainforests coming under the protected area network, the fragmentation is an issue of serious concern. For many species, with the effects of fragmentation manifesting over a long period of time, this has the same consequences as extinction. It is extremely necessary that the conservation value of remnant patches of rainforests and the management options to retain these values be assessed urgently.

This study has been initiated with the objectives to (1) identify the major factors governing faunal distribution and abundance in a large, contiguous and relatively undisturbed rainforest in Kalakkad-Mundanthurai tiger reserve; (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;

Ravi Chellam

Philautus species from Western Ghats

(3) develop a set of statistical models based on (1) and (2) above, 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.

Three of the five researchers slated to work in this project have been recruited. Between December 1995 and February 1996, they did a literature review of the subject, besides writing up their individual Ph.D proposals. A short field trip was made in February to work out the logistics there. Actual field work is scheduled to begin in May 1996.

*** Development of an Indian Cooperative Wildlife Health Programme.**

Faculty : Dr PK Malik

At WII, wildlife health has been one of the major topic of teaching in the regular courses and an applied component in most of its research programmes, successfully integrating the disciplines of veterinary medicine and wildlife management. Also, in this aspect, the institute closely interacts with, consults and advises PA managers, state

wildlife agencies, animal husbandry departments and veterinary institutions. But it has not been possible for WII to address the wildlife health needs for the entire country nor timely respond to requests for assistance. However, the problem facing wildlife health is much larger.

In India, while considerable progress has been made in disease control in domestic animals, hardly anything 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. In the event, diseases occur in wild animals and mortalities from it become widespread even before they are noticed, it is impossible to mount satisfactory disease investigations and take preventive measures. Ironically this is the situation when many of the veterinary medical institutions, with their associated diagnostic facilities, are located in close proximity to large wildlife areas.

This project, started last year, seeks to initiate a nationwide programme that would address the wildlife diseases and related issues in a timely, effective and comprehensive manner. Accordingly, a wildlife health programme is to be developed at selected veterinary medical institutions in India.

The objectives of the project are to advance the capabilities of the selected 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.

One veterinarian (from Anand Veterinary College, Gujarat) is undergoing the Diploma in Wildlife Management at WII. The three veterinarians who had taken this training last year under Phase I, went on a study tour to the USA from 15 July to 23 September 1995, and have been designated the Wildlife Health Coordinators (WHC) of the Indian Wildlife Health Cooperative Centres (IWHCC) in their respective areas.
The IWHCC (Eastern Region) at Guwahati Veterinary College, Assam, provides a regular health care service to the Guwahati zoo. It has conducted a ring vaccination programme of domestic livestock in and around Kaziranga national park and is now investigating into the mortality of highly endangered white winged wood duck at Miao (Arunachal Pradesh) where only one breeding pair remains from its previous strength of 34. It is also setting up a field lab in Kaziranga to monitor the health of captive and wild animals in the national park, for which funds are being provided by the Indian Council of Agricultural Research.

The IWHCC (Southern Region) at Madras Veterinary College, Tamil Nadu, has started a M.V.Sc course in wildlife science which has been designed by WII. The College has created a new Department of Wildlife Medicine which, among other things, has adopted and provides 24 hr health care facility to the Madras zoological garden. The zoo also acts as a training site for the researchers of the wildlife medicine department. WII and IWHCC are working on a proposal to investigate diseases and other health conditions of domestic elephants in Tamil Nadu.

The IWHCC (Central Region) is currently involved in two WII's research projects; at Panna and Pench national parks in Madhya Pradesh. It's also developing a project for seroepidemiological studies on some select endangered wildlife species in Madhya Pradesh.

USDA FOREST SERVICE

*** Management of forests in India for biological diversity and forest productivity - A new 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

This project aims to evolve approaches and practices for integrated forest management planning which are essential for the conservation of biodiversity and enhanced productivity of forest ecosystems. This would be in keeping with India's National Forest Policy, 1988.

The project started in January 1996. It will be conducted in selected sites in five states over a period of five years - Balphakram NP, Nokrek NP and the Siju WLS in Meghalaya; Dudwa NP and surrounding forests in Uttar Pradesh; Satpura NP, Bori and Pachmarhi WLS 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 NP, Annamalai WLS 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.

Personnel involved would be the field managers of these areas, faculty members from WII and the Indira Gandhi National Forest Academy (IGNFA), Dehra Dun besides scientists and line officers from the USDA Forest Service.

S. Sathyakumar
Scenic view of Kedarnath wildlife sanctuary

ORGANIZATION

The WII Society has 35 members, headed by the Union Minister for Environment and Forests. Other members include some State forest ministers, nominated Members of Parliament and UP Legislative Assembly, officials from several central government ministries and departments, NGO representatives and eminent individuals. The Third Annual General Meeting of the Society took place on 5 September 1995.

The actual functioning of the institute is directed by a 15-member Governing Body, presided over by the Secretary, Ministry of Environment and Forests. The Governing Body met twice this year : XVII GB Meeting was held on 2 August 1995; and XVIII GB Meeting on 30 March 1996.

In 1995-96, the XVI meeting of the Research Advisory Committee (RAC) was held on 8 June 1995 at Dehra Dun. Six project proposals were considered during this meeting and five of these were conditionally approved with changes based on the comments made by the RAC members.
The XVII meeting of the RAC was held on 27 September 1995 as part of the IX Annual Research Seminar at Dehra Dun. During this meeting three of the revised proposals which were considered in the previous RAC meeting were approved and the tenure of the ongoing Himalayan musk deer project in Kedarnath wildlife sanctuary was extended. Five new project proposals were considered and all were approved by the RAC.

DEVELOPMENT

UNDP collaboration

The Government of India - UNDP project titled "Strengthening Wildlife Management and Ecodevelopment Planning Capabilities" which was to end in December 1995 was extended by one year to make up for the time lost at the start up.

Overall, two courses each have been conducted on Wildlife Management Planning and on Ecodevelopment Planning. The Field Planning Officers (FPOs) after their training in these courses have started doing the actual planning work in the field. In this, they were assisted by the project faculty, national and international consultants and WII faculty members. The project faculty is also helping individual FPOs organize workshops to strengthen their planning work. Initial draft plans from sites such as Pakhui, Kanawar, Melghat, Srisailam, Jaldapara, Kedarnath, and Rajaji protected areas have started coming in.

This year, "Ecodevelopment for Biodiversity Conservation" has been placed as a special module in WII's ongoing Diploma course. Eleven officers have joined this module as `lateral-entrants'. During 1995, equipment worth $ 37,929 was also bought. The national as well as international consultants provided their inputs in the various courses and training programmes of the institute through classroom lectures and seminars and in the field by interacting with the officers trainee on the management problems of protected areas.

WII-University College, London

University College London (UCL) conducts a Master's course in nature conservation. In view of the different focus, approach and issues dealt with in the Master's courses of WII and UCL, a programme has been co-sponsored by the British Council and WII on mutual exchange of faculty members on short-term lecturing assignments. It is hoped that the exchange of ideas generated by this two-way movement of faculty members would strengthen and help improve both the courses.

During 1995-96, WII played host to two faculty members from UCL. Dr Andrew Warren came in August-September 1995 to teach geomorphology, physical aspects of the environment and desertification to WII's M.Sc students. In March 1996, Dr Brian Wood came and he taught behavioural ecology and the conservation of natural resources. The same month, BC Choudhury (Scientist SE, Management) visited UCL and lectured on wetland ecology and conservation with specific reference to the Indian scenario.

ARRIVALS

The following personnel joined WII on deputation and through direct recruitment:

Ajai Saxena, Scientist SE	On Deputation
Dr SP Singh, Scientist SE & Registrar	On Deputation
SG Chavan, Asstt. Estate Officer	On Deputation
Ms Prem Kumari, Stenographer Gr-II	On Deputation
Ravindra Nath, LDC	Direct Rectt.
Ms Sadhna Verma, LDC	-do-
Balbeer Singh Chauhan, (Tradesman-A)	-do-

SERVICES AND FACILITIES

CONSULTANCY

Environment impact assessment

In response to the mandatory need for reliable environmental impact assessment of development projects, and encouraged by its own experiences in carrying out such assessment in three large projects, WII created a separate Environment Impact Assessment (EIA) cell. It has since been receiving consultancy offers from various agencies for doing pre-assessment studies of the impact of development projects on wildlife values.

During 1995-96, the EIA cell was offered consultancies by M/s Engineers India Ltd., Bharat Petroleum Corporation Ltd., and Gas Authority of India Ltd. to evaluate the impacts associated with pipeline projects and the establishment of LPG Recovery Units. The projects for which EIA studies have been done and the technical reports submitted to respective agencies include - Bombay-Manmad Pipeline Project, Jorhat-Numaligarh Pipeline Project, Oman-India Gas Pipeline Project, Cochin-Coimbatore-Karur-Tiruchchirappalli Pipeline Project and the proposed LPG Recovery Plant Project at Usar in Maharashtra. The studies, besides outlining the areas of concern with respect to impact of these projects on wildlife values, have aided in establishing mitigatory measures. Moreover, such studies allow WII to build up database on the status and distribution of wildlife species in areas outside the protected areas. The reports submitted this year are enlisted under "Publications".

Management of elephant populations

At the invitation of the 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". Sanctioned by the concerned department under the wildlife and biodiversity components of the West Bengal Forestry Project which is funded by the World Bank, this consultancy would be conducted in two major elephant habitats in north and south Bengal. The consultancy team is headed by Dr S Chowdhury (Scientist SE, Management) and includes seven other faculty members from WII plus two from the Institute of Remote Sensing, Dehra Dun, besides researchers and technical assistants.

The field work was initiated in August 1995 with the establishment of field stations in north and south Bengal. Since then, four elephants - three (one *makhna* & two tuskers) in north Bengal and one (tusker) in south Bengal - have been radio-collared. So far, two important corridors in north Bengal - from Jaldapara to Bhutan via Titi forests, and between Buxa and Manas across the river Sankosh - have been delineated. Data collected on these elephants has been on their movement, habitat use and its changing patterns in different seasons from open mixed forests to dense mixed

forests, interaction between the males, their association and dissociation pattern within and outside the family herd so as to develop a picture of male's breeding strategy in the population. Information is also being collected on other aspects like food and feeding habits, nutrition quality of the food, man-elephant conflict and evaluation of economic losses due to the increasing conflicts with elephants in both the regions.

There are plans to radio-collar few more matriarchs in north and south Bengal which would reveal a comprehensive home range and habitat use picture for both the populations. An interim report based on six months field work has already been submitted to West Bengal Forest Department.

Integrated Protected Area System

Last year, WII undertook this consultancy on a World Bank aided Andhra Pradesh Forestry Project, "Preparation of an integrated protected area system (IPAS)". WII's tasks were to :

(i) identify ecologically significant areas for inclusion in the PA system with emphasis on currently under-represented north-eastern Ghats, southern thorn forests, dry evergreen forests, and other important habitats of rare and endangered species;

(ii) rationalize PA boundaries and zonation with consideration to biological, sociological and administrative aspects;

(iii) identify and recommend corridors which may be significant for wildlife management;

(iv) review the existing wildlife management plans and formulate guidelines for PA management plans;

(v) suggest guidelines for management of forest plantations with reference to conservation concerns;

(vi) identify and prioritize research, extension and training needs for implementation of the IPAS plan; and

(vii) design a database system for the implementation of IPAS.

The consultancy team was headed by VB Sawarkar (Head, Management) and included seven other WII faculty members besides JJ Dutta (Retd PCCF, Madhya Pradesh). The field work relating to the tasks assigned was completed by mid-June 1995. Report preparation proceeded alongside.

As per the terms of the contract, a workshop was conducted at Hyderabad on 20-21 June 1995. This was attended by middle and senior level forest officers of Andhra Pradesh Forest Department, besides wildlife managers, representatives of other like disciplines, working plan and wildlife management planning officers, officers from forestry research and NGO representatives. Ten sets of preliminary reports on each task had already been circulated to obtain further suggestions, which were necessary for finalizing the reports. All reports have since been finalized.

Biological survey in Bhutan

Dr GS Rawat (Scientist SE, Biology) visited Bhutan in June-July 1995. This was his second visit there as part of an ongoing consultancy for WWF-Bhutan Programme and Nature Conservation Section (NCS) within Forestry Services Division, Royal Government of Bhutan (RGoB). During his earlier visit, Rawat had helped conduct biological surveys in Jigme Dorje National Park (JDNP) in Bhutan and train the NCS counterparts in the techniques of vegetation and floral surveys and plants identification. Based on such survey, a conservation management plan was to be drafted, and the survey would also ultimately help in establishing a national database at Thimpu.

Rawat and his NCS counterparts presented the findings of their final biological surveys of JDNP at a debriefing session on 12 July 1995 to representatives from the UNDP, Forestry Services Division, Ministry of Agriculture, National Institute of Traditional Medicine, Tourism Authority of Bhutan, and Dzongkhag (district) officials.

The survey findings and workshop resolutions are being incorporated into the park's five-year plan.

OTHER CONSULTANCIES

Special diploma course: FAO granted consultancy for teaching in the Special Diploma course for Sri Lankan wildlife rangers for Phase-I in Sri Lanka. The following faculty members were assigned the task : VB Sawarkar, Dr VB Mathur, BMS Rathore, Dr YV Jhala.

Cattle predation: On the request of Kishore Chaudhary, Tiger Link, Calcutta, WII deputed Dr NPS Chauhan (Scientist SD, Management) and Dr KS Rajpurohit (Research Associate) to investigate the problem of cattle-lifting by tigers and leopards in Palamau tiger reserve. They conducted a study in and around the reserve from 27 May to 2 June 1995. Information on cattle grazing pressure inside the park was also collected and collated with cattle predation incidences.

Nilgai problem at air base: Dr NPS Chauhan looked into the problem of nilgai at the Suratgarh Air Force Base in December 1995. The 200 acres base is enclosed by 7 ft high double barbed-wire fencing. But there are about 20 nilgai within this fenced area, which are a threat to safe flying of aircrafts from the base. Further investigation of the problem is in progress following which mitigation strategies would be formulated.

Monkey menace: On the request of the Chief Security Officer, Ministry of Defence, New Delhi, Dr NPS Chauhan looked into the problem of monkey nuisance in and around South Block of Sena Bhawan. Mitigation methods to get rid of the monkey menace have accordingly been suggested.

TECHNICAL SUPPORT

Management planning: On behalf of the Government of the National Capital Territory (NCT) of Delhi, WII had undertaken a project to develop a management plan for the "Asola-Bhatti wildlife sanctuary". This has been reported in detail in the Annual Report 1994-95. The final report has now been completed and forwarded to the Development Commissioner, NCT of Delhi.

The major features of the report are - inventories of floral and faunal resources in the area showing significant additions over earlier checklists, identification of a wetland habitat near the Badarpur mines which has potential for supporting diverse aquatic flora and fauna, and recommendations on controlled fuelwood extraction by the local people. It also suggests on providing protection to the area and doing plantation work only after a couple of years of natural regeneration, on preference to low-key educational tourism and avoiding large scale tourism, and on conflict mitigation, zonation and ecodevelopment measures.

TEACHING INPUTS

* A student of Master's course in Environmental Science at Indira Gandhi Academy of Environmental Education, Research and Ecoplanning, Jiwaji University, Gwalior sought placement for training in EIA. During the eight-week training, the student worked on a project entitled "*Impact of Vehicular Traffic on Urban Environment of Dehra Dun*" under the supervision of Dr Asha Rajvanshi, Scientist SD and faculty incharge, EIA cell. The student submitted this project report as an assignment for partial fulfilment of the requirements of the Masters course.

* Centre for Environmental Management and Planning (CEMP), Aberdeen University Research and Industrial Services Ltd, Scotland (UK) conducted an Intensive Training Course on Environmental Assessment and Management at Aberdeen. The trainees included 19 professionals from 17 countries. Dr Asha Rajvanshi was invited as a guest faculty during 2-5 August 1995 to deliver professional inputs in the course component - Environmental Assessment of Linear Development.

* Qamar Qureshi (Scientist SD, Management) taught M.Sc wildlife at Aligarh Muslim University, Aligarh.

COMPUTER AND GIS

The computer facilities at WII, among the best the country in the field of wildlife studies, serves the training, research,

database, cartography including GIS, digital image processing of remotely sensed data and desktop publishing needs of the institute. A Computer Committee provides the necessary guidance and supervision of the computer centre and its facilities.

During 1995-96, these facilities were further strengthened through procurement of new hardware and upgradation of the old systems. A total of 30 486DX2 systems were procured alongwith 23 dot matrix printers, three inkjet printers and 23 600VA UPS systems. Out of these, 12 486DX2 systems, printers and UPS systems were provided to Field Planning Officers (FPO's) under the UNDP project on "Ecodevelopment Planning and Wildlife Management Planning". Seventeen old 286 and PC/XTs systems were upgraded to 486DX2 systems. One old Macintosh Classic was upgraded to Power Macintosh and an old HP Laserjet Series II printer to HP Laserjet 4M plus. The institute now has a total of 100 nodes with 2 fileservers and a Sun Sparcstation 2 system on the Local Area Network.

The computer centre conducts training courses on the use of computers and various software packages for the officers trainee of the Diploma and Certificate courses. Similar courses are organized for fresh JRF, SRF, RA, TA and M.Sc students. A special training on 'Computer Applications in Wildlife Management' was also organized for the Sri Lankan trainees undergoing Special Diploma Course in Wildlife Management at the institute.

LIBRARY AND DOCUMENTATION CENTRE

The rapid technological development the world over has increased manifold the value of information documentation and dissemination. In fact, today, no research or training programme or institutional development anywhere can be said to be pragmatic and complete if libraries don't play a positive role in it. The library and documentation centre at WII is growing fast to play that critical role. Besides the in-house users, the library services and document delivery are also available to outsiders in person or through correspondence, on payment.

During 1995-1996, 1400 new titles were added to library collection. The library also subscribes to 262 national and international journals. Besides this, 6673 reprints and over 7000 topographic maps are available.

Apart from the usual collection, organisation, lending and reference service, the WII library provides current awareness service (CAS), retrospective search services (RSS), bibliographic services on demand and anticipation, and inter-library loan (ILL) service. Press clipping service on wildlife and its allied subjects, photocopy service, CD-Database search from (i) Wildlife and Fisheries review 1971-date, (ii) CAB abstract, (iii) E-CD spectrum 1973-1994, and (iv) Biological abstract (1989) sample covering references on mammals, birds, reptiles, amphibian, veterinary medicine, microbiology, animal nutrition, biotechnology, tourism, environmental economics, biological conservation, deforestation, desertification, etc. are also available.

For bibliographic information of the library and documentation centre, OPAC (Online Public Access Catalogue) was provided in LAN, using a LIBSYS-WINDOW multiuser system.

A project was completed for computerized circulation control and rectification of in-house database to make an effective use of Barcode technology and provide quick service. An indexed bibliography on *Application of Telemetry in Wildlife Conservation* was also compiled.

A display counter has been set up in the library to promote the institution's publications and products.

LABORATORY

The laboratory at WII was established to support research work by analysing the samples collected from the field so that these can be used in the different training programmes as well. As such the laboratory has two sections - teaching and research. Laboratory practical are conducted for various regular or short-term courses in the teaching section. In the research section, facilities are available for protein

estimation of plant samples, fat estimation, energy value determination, pH value, carnivore scat analysis using Thin Layer Chromatography Technique (TLC), herbivore faecal pellet analysis, etc.

During the year under reporting, 40 soil samples collected from Asola-Bhatti wildlife sanctuary for testing their water retention capacity, 190 pellet samples collected from Eravikulam national park, 250 samples from Pin Valley national park collected for organic carbon & 200 samples for calorific value and crude protein, 43 samples collected from Kedarnath wildlife sanctuary for organic carbon, moisture content and pH were analyzed in the laboratory.

The laboratory facilities are also available to wildlife managers, the police departments and the Directorate of Revenue Intelligence (New Delhi) for identification of confiscated materials in offence cases. During 1995-96, eleven wildlife offence cases were referred to WII for forensic assistance.

AUDIO-VISUAL UNIT

The audio-visual unit in the Extension faculty maintains equipment like cameras and accessories, slide projectors, film projectors, overhead projectors, TV, VCR which are extensively used as teaching aids in classroom lectures as well as in the field. During 1995-96, ten new video films were purchased and about 1000 colour transparencies were added to the unit's photo library.

The institute has developed a slide programme "We are Nature, Nature is our World" which is synchronized on nine projectors. Hitherto, whenever this show was organized, professional services had to be hired from Delhi to run it. Now, however, the institute has acquired the capability of running the show on its own. WII purchased the equipment in May 1995, and Samuel Wilson and Vinod Verma of the AV unit undertook a seven-day training in the operation of the equipments and the slide show. The first independent

Vinod Verma

Projection of nine projector synchronised AV programme

show was given at the Annual Research Seminar. The show has since been organized on several occasions. It was shown to the public at the "Virasat" fair organized by SPIC-MACAY at ST Joseph's Academy grounds, Dehra Dun on 14-23 November 1995.

HERBARIUM

The institute's herbarium houses angiosperm, gymnosperm and fern samples collected by students, researchers, trainees and faculty members from the various protected areas all over the country. Plant specimens were received for identification, mounting and processing from Great Himalayan national park (Himachal Pradesh), Bandhavgarh national park (Madhya Pradesh), Balaphakram tiger reserve (Mizoram) and the Bhagirathi valley (Uttar Pradesh). The herbarium staff also assisted in the detailed floristic surveys in Asola-Bhatti wildlife sanctuary (Delhi), various protected areas in Andhra Pradesh, Great Himalayan national park and Bandhavgarh national park. Checklists of plants for these areas have been updated. Work on placing herbarium data on to the computer for accession and verification of nomenclature and identification is in progress.

PUBLICATION

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 the year 1995-96, an *Information brochure on courses at WII* and two long awaited publications *Kanha Manual* and *Pheasants of India* were brought out. Also published was the long awaited *Buffer Zone Management* workshop proceedings. Among regular publications were the *Annual Report 1994-95*, and *WII Newsletter*.

CAMPUS DEVELOPMENT

Phase II construction comprising new hostel block, 10 Type IV/V faculty houses and 20 Type I, II, III houses is in final stages of completion. Internal electrification work in the above buildings has so far been completed in Block III (Residential houses). Road electrification has been completed in Block III, while it is in progress in the new hostel block and Block IV. Provision of electric service connection to above buildings is in advanced stage and expected to be completed soon. External water supply to the new hostel block, Block III and Block IV is now available.

Approach road for Block IV and new hostel block has been laid out with WBM and completed. A deck slab culvert bridge over storm water channel was necessitated to connect new Type IV, V houses to Block IV which has been completed. Dry stone pitching has been done alongside the channel for prevention against damage to the channel due to overflowing of the storm water channel. Most of the barbed wire fencing work in Block IV has been completed while in the remaining southern end is expected to be completed soon. Carpeting will be carried out later.

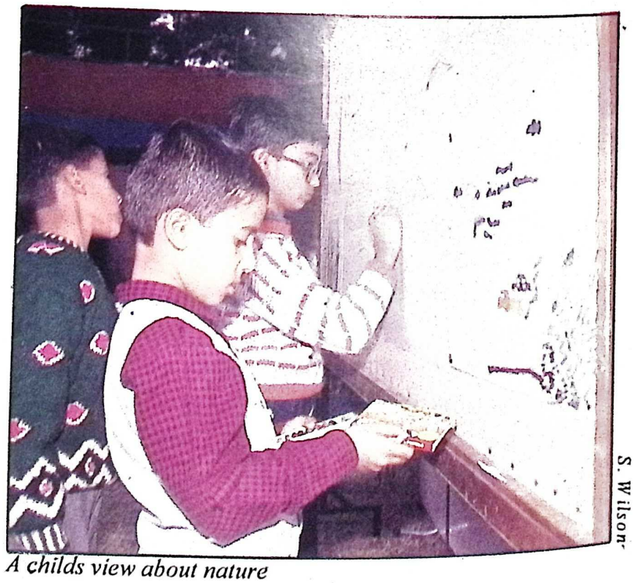
The earthen dam, located in the north-west of the new hostel block and being constructed as part of landscape beautification and for wetland and fishery studies in the future, has also been completed.

Total expenditure incurred on account of campus development during the year amounted to Rs 2.26 crores.

EXTENSION

Ecodevelopment initiative: The ecodevelopment initiative which had started in the villages around WII campus has taken deeper roots during the reporting period. Last year, bamboo, shrubs and fibre-yielding trees were planted in the institute's Block II forest with the help of the Chandrabani residents. Villagers, who have provided an effective social fencing to this plantation, were allowed to cut grass for their cattles on a rotational basis from the WII main campus. During the 1995 summer, the villagers also helped the institute's personnel in controlling fire which had broken out in its experimental forest.

Environment day: Drawing, debate and quiz competitions were organized for the children of Chandrabani village and WII staff on the occasion of the World Environment Day, 5 June 1995. In all, about 100 children in the age group 4-13 yrs participated in these competitions. Winners were presented prizes and merit certificates.



S. Wilson

A childs view about nature

Wildlife week: The first week of October is celebrated as the "wildlife week". The Institute had planned for a wildlife film show, a drama on the theme of wildlife conservation, and a demonstration of fuel efficient *chullah* for the residents of Chandrabani village. But these could not be carried out because of the Uttrakhand agitation which got intensified at the time. However, the children of Chandrabani participated in garbage cleaning and weeding operation in the institute's forest on 1 and 2 October 1995.

Sports and games: Improving on last year's performance, the WII cricket team won four tournaments during 1995-96. These were - *Dehra Dun Cricket League Championship*, April 1995, organized by Dehra Dun District Cricket Association; *Central Government Employees Welfare Cricket Club Tournament*, May 1995, organized by Survey of India, Dehra Dun; *Agrarian Cricket Tournament*, November 1995, organized by the Agrarians Group of Companies, Dehra Dun; and *Dr Virendra Swaroop Memorial Cricket Tournament*, February 1996, organized by Doon Boys Club, Dehra Dun.

The IV All India Forest Sports and Games Meet was held at Thiruvananthapuram (Kerala) on 27-30 December 1995, in which WII participated with a contingent of 27 players. WII won silver medals in rifle shooting and table tennis (women, singles) and bronze medals in cricket and table tennis (women, doubles).

VISITORS

* Delegations from China, Nepal, South Africa, Japan and the British Council.

* FAO officials - Dr WA Rodgers, CTA (FAO-Tanzania), Peter Rosenger and other delegates.

* Ministers of Forests and Agriculture, Laos PDR.

* Fred Bagley, US-FWS

T.R.K. Yoganand

Cocculospermum gossypiana, Yellow Silk Cotton in Panna national park

PERSPECTIVE 1996-97

Last year (1994-95), a study was conducted on behalf of the Ministry of Environment and Forests to look into the workload of the faculty and the institute's future staff and infrastructural requirements. On the basis of this study, WII revised its EFC Memorandum which was then sent to the Centre for consideration. The revised EFC Memorandum for WII for the VIII-plan was approved in November 1995. However, it has been stated that fresh recruitment to new posts could not be done without the permission of the Finance Department. Under the circumstances, WII may have to go in for short-time contractual arrangements in some cases.

This year, the FAO/UNDP project for Ecodevelopment Planning and Wildlife Management Planning courses will come to an end and we plan to organize a National Workshop in November 1996 on this before doing the terminal review. The WII-UCL faculty exchange programme as part of the M.Sc course will continue. A new initiative "Building Partnership for Biodiversity Conservation in Rajaji National Park" is planned with financial support from the Ford Foundation. The research projects for the second phase of WII-USFWS & USFS collaboration under Indo-US Sub-commission on Science and Technology, which have been started, will give WII further opportunity for capacity building and improving professional skills in the field of wildlife research.

A number of short courses and workshops are on the anvil, and some of the new initiatives for coming year are :

- SAARC workshop on wildlife management
- Workshop on GIS
- Workshop on EIA
- TOT workshop on CBT and learning resource development
- Workshop on extension management
- Wetland research and monitoring workshop

The WII Society has constituted a Training, Research and Academic Council (TRAC) and its first meeting is slated for September 1996. WII's library, computer centre and laboratory will continue to be constantly updated to meet the current requirements of the users.

The EIA cell, continues to get more consultancy work. Besides assignments on hydro electric and pipeline projects, WII is now getting EIA studies for mining projects as well. It is proposed to strengthen the EIA cell.

The Phase II constructions of WII have been almost completed. There were further plans for work on another modular building, interpretation and large seminar halls, and housing and sports complex, etc. but these may not be taken up during 1996-97 for want of funds and so will be considered only in the next plan period.

(SK Mukherjee)
Director

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SHILLONG - 793 001

6. Sh. Subimal Roy, IFS
Chief Conservator of Forests &
Chief Wildlife Warden,
Government of West Bengal,
Bikas Bhavan, North Block,
3rd Floor, Salt Lake City,
CALCUTTA - 700 091
(West Bengal)

7. Thiru B. Arulprakasham, IFS
Chief Conservator of Forests
Chief Wildlife Warden,
Government of Tamilnadu,
Children Corner,
Guindy National Park,
22, Raj Bhavan Post,
MADRAS - 600 022

8. Sh. Jagir Singh, IFS
Chief Wildlife Warden &
Director Nature Conservation,
Jaika Building, Civil Lines,
NAGPUR - 440 001

9. Shri J.C. Daniel
Bombay Natural History Society
Hornbill House
Shaheed Bhagat Singh Marg
BOMBAY - 400 023

10. Prof. J.S. Singh
Advance Centre in Botany
Banaras Hindu University
VARANASI, U.P.

11. Prof. A.H. Musavi
Chairman
Centre of Wildlife and Ornithology
Aligarh Muslim University
ALIGARH, U.P.

12. Shri S. Debroy,
Retd. Additional Inspector General of Forests (WL)
24/4 Type 5, Lodi Complex
NEW DELHI - 110 003

13. Dr. M.L. Thakur,
Head, Entomology Division,
Forest Research Institute,
P.O. New Forest, **DEHRA DUN - 248 006**

14. Shri S.K. Mukherjee
Additional Director
Wildlife Institute of India
Chandrabani, **DEHRA DUN - 248 001**

15. Dr. A.J.T. Johnsingh
Head Wildlife Biology Faculty
Wildlife Institute of India
Chandrabani, **DEHRA DUN - 248 001**

16. Dr. Ravi Chellam
Research Coordinator
Wildlife Institute of India
Chandrabani, **DEHRA DUN - 248 001**

17. Director,
Wildlife Institute of India
Chandrabani, **DEHRA DUN - 248 001**

GOVERNING BODY

1 Shri N.R. Krishnan,IAS
Chairman
Chairman Governing Body &
Secretary to the Govt. of India,
Ministry of Environment & Forests,
Paryavaran Bhavan, B-Block,
CGO Complex, Lodi Road,
NEW DELHI - 110 003

2. Shri M.F. Ahmed, IFS
Vice-Chairman
Inspector General of Forests,
Ministry of Environment & Forests,
Paryavaran Bhavan, B-Block,
CGO Complex, Lodi Road,
NEW DELHI - 110 003

3. Shri S.C. Dey, IFS
Member
Addl. Inspector General of Forests &
Director Wildlife Preservation,
Ministry of Environment & Forests,
Paryavaran Bhavan, B-Block,
CGO Complex, Lodi Road,
NEW DELHI - 110 003

4. Shri S. Deb Roy,
Member
A/16, Shalimar apartment,
South Ex. Plaza II, 209 Masjid Moth,
New **Delhi - 110 049**

5. Shri Shivbhadra Sinhji,
Member
'Bhavvilas',
Near Gaurishankar Lake,
BHAVNAGER - 364 003
GUJARAT

6. Dr. Ishwar Dass,
Member
E-1/154, ARERA - Colony,
BHOPAL - 462 016
MADHYA PRADESH

7. Shri Ashish Chandola,
Member
H-6B, Hauz Khas,
NEW DELHI - 110 016

8. Shri P.K. Brahma,
Member
Joint Secretary (Finance),
Ministry of Environment & Forests,
Paryavaran Bhavan, B-Block,
CGO Complex, Lodi Road,
NEW DELHI - 110 003

9. Shri N.K. Joshi,IFS
Member
Director General,
Indian Council of Forestry Research &
Education, New Forest,
DEHRA DUN - 248 006

10. Dr. K.J.S. Chatrath,
Joint Secretary (Education),
Department of Education,
Ministry of Human Resource Development,
Shastri Bhavan,
NEW DELHI-110 001.

11. Dr. Ashok Singh, IFS
Member
Chief Wildlife Warden,
(Representative of Chief Secretary,
Govt. of Uttar Pradesh),
17, Rana Pratap Marg,
LUCKNOW - 226 001

12. Dr. B.C. Choudhury,
Member
Scientist-SE,
Wildlife Institute of India, Post Box 18,
DEHRA DUN - 248 001

13. Shri S.K. Mukherjee,
Member Secretary.
Director
Wildlife Institute of India, Post Box 18,
DEHRA DUN - 248 001

AUDIT CERTIFICATE

I have examined the Receipt and Payment Account, Income and Expenditure Account for year ended 31st March, 1996 and the Balance Sheet as on 31st March, 1996 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.

Sd/-
Principal Director of Audit

New Delhi
Dated : December, 1996

RECEIPTS AND PAYMENTS FOR THE YEAR ENDING 31ST MARCH, 1996.

RECEIPTS		PAYMENTS	NON PLAN	PLAN	TOTAL
To opening Balance:		By salaries	36,66,234.00	50,35,213.00	87,01,447.00
Cash in Hand	93,268.80				
Cash in Bank	1,44,14,489.88	By Leave salary & Pension contribution	38,379.00	-	38,379.00
Balance in Bank					
Training Account	1,16,174.41	By Bonus	2,56,479.00	-	2,56,479.00
		By Honorarium	56, 771.00	83,000.00	1,39,771.00
		By Fellowship	-	8,00,752.00	8,00,752.00
To Grant-in-aid					
Department of Environment &		By Wages	1,83,390.00	2,52,089.74	4,35,479.74
Forests, New Delhi	4,35,00,000.00				
		By Travel Expenses	5,45,178.00	7,35,197.50	12,80,375.50
To Training Cost		By Newspapers & Magazines	25,693.00	-	25,693.00
Training cost received during	7,99,554.00				
the year		By Publicity & Advertisement	1,38,614.00	-	1,38,614.00
Outstanding training cost received	4,00,000.00				
during Year					
Other rceipts	13,140.00				
Outstanding Advance for expenses	2,52,802.00	By Operational Expenses	15,13,302.00	22,11,719.00	37,25,021.00
received					
Interest from Bank A/c (Training)	12,640.00	By stationery	1,87,328.00	3,17,649.00	5,04,977.00
To Special Diploma course (Srilanka)	21,04,320.00				
To Interest Credited by Bank	3,92,729.00	By over Time Allowance	16,575.00	69,988.00	86,563.00
		By Rent for hired Buildings	1,26,839.00	-	1,26,839.00
To Penal Interest	313.00				
		By Postage & Telegram	25,751.00	1,08,730.00	1,34,481.00
To GP fund Remittance Due	1,382.00				
		By sports Goods	30,906.00	-	30,906.00
To recoveries on account of cement	7,74,968.00				
and steel		By Telephone & Trunk calls	3,67,932.00	5,09,047.00	8,76,979.00
To P.L.I. Premium	19.00	By Conveyance Charges	13,526.00	-	13,526.00
To F.D.R. encashed	25,00,000.00	By Electricity & Water Charges	6,08,897.00	10,04,234.67	16,13,131.67
To Pension Fund		By Entertainment	21,138.00	37,030.00	58,168.00
Opening Balance					
Cash in Bank 3,42,493.00		By Printing & Binding	16,807.00	18,744.00	35,551.00
Kisan Vikas	17,92,493.00				
Patra 14,50,000.00		By Repair of Office Equipment	-	17,818.00	17,818.00
Receipt during the year	3,07,452.00	By L.T.C.	19,870.00	47,881.00	67,751.00
C/F	6,74,75,745.09	C/F	78,59,609.00	1,12,49,092.91	1,91,08,701.91

RECEIPTS			PAYMENTS	NON PLAN	PLAN	TOTAL
B/F		6,74,75,745.09	B/F	78,59,609.00	1,12,49,092.91	1,91,08,701.91
To GP Fund			By Refund of with-held amount	-	3,932.00	3,932.00
Opening Balance			from contractor's bills			
Cash in Bank	2,17,250.03	32,17,250.03				
Kisan Vikas Patra	30,00,000.00					
Receipt during the year		14,91,491.00	By Audit Fees	6,450.00	-	6,450.00
To CGEIS Refund		54,250.90	By Refund of Security Deposits	-	2,55,039.00	2,55,039.00
WII Receipts (Institutional Charges)		57,084.00				
To Income Tax From Salary		7,900.00	By Auditorium	-	81,923.00	81,923.00
To Income Tax from Contractors		43,438.00	By Refund of Tender Cost	-	16,860.00	16,860.00
To Sales Tax from Contractors		40,661.00	By Uniform	66,090.00	-	66,090.00
To Loan & Advance (Staff)			By Exhibition	88,697.00	-	88,697.00
House Building Advance	1,01,756.00					
Scooter Advance	14,436.00		By Insurance of Research			
Cycle Advance	2,852.00	1,35,652.00	Fellows & Faculty Members	-	15,268.00	15,268.00
Computer Advance	14,808.00					
Festival Advance	1,800.00		Office Equipment	-	2,24,815.00	2,24,815.00
To Advance for Expenses		21,17,582.00	By Land Scaping	-	5,92,715.00	5,92,715.00
To Nanda Devi Biosphere Reserve Proj.		96,000.00	By Stipend to M.Sc. Students	67,015.00	-	67,015.00
To Receipt from Director, Rajaji N.						
Park for Elephant Action Plan Workshop			By Legal Expenses	-	15,750.00	15,750.00
to be held in June 1996		75,000.00				
			By Publication	-	3,32,107.25	3,32,107.25
To M.Sc. Course Fee		6,93,810.00				
			By Training Cost on Course	-	-	32,19,817.00
			By Govt. Contribution to	-	10,48,000.00	10,48,000.00
			Pension Fund			
To Miscellaneous Receipts						
i)Guest House	70,035.00		By repair and	4,81,744.00	-	4,81,744.00
Charges			maintenance of vehicle			
ii)Lab. Testing	300.00	3,21,832.00				
iii) H.L.Fee	1,81,457.00		By POL for Vehicle	3,42,653.00	4,02,314.00	7,44,967.00
iv) Seminar and	70,040.00		By Avenue Plantation	-	3,03,407.00	3,03,407.00
Workshop						
To cost of wood		4,456.00	By purchase of Vehicle	-	3,04,703.00	3,04,703.00
			By Journals & Periodicals	-	22,41,229.90	22,41,229.90
			By Laboratory Chemicals	7,965.00	33,635.00	41,600.00
				89,20,223.00	1,71,20,791.06	2,92,60,831.06
C/F		7,58,32,152.02	C/F			

RECEIPTS		PAYMENTS	NON PLAN	PLAN	TOTAL
	B/F 7,58,32,152.02		B/F 89,20,223.00	1,71,20,791.06	2,92,60,831.06
		By Audiovisual Computer & Training Equipment	-	20,56,284.00	20,56,284.00
		By Photographs & Photographic materials	-	1,59,007.00	1,59,007.00
		By Educational Films	-	12,275.00	12,275.00
		By Furniture & Fixtures	-	2,92,260.00	2,92,260.00
		By Library Books	-	9,36,258.00	9,36,258.00
		By Advance for Expenses	-	-	28,39,826.26
		By Advance for Expenses (Training)	-		28,584.00
		By Loans and Advances (Motor Car Adv)		-	60,724.00
		By Pension Fund	-	-	28,117.00
		By G.P.Fund	-	-	9,75,817.00
		By Construction of Building	-	1,87,26,186.00	1,87,26,186.00
		By Campus Development	-	4,30,960.00	4,30,960.00
		By Construction & Archtectural Management Fee	-	14,46, 022.00	14,46,022.00
		By Camp Equipment	-	1,03,092.00	1,03,092.00
		By Road & Culverts	-	2,74,989.00	2,74,989.00
		By Estate Maintenance	-	10,70,335.00	10,70,335.00
		Closing Balance			
		By Cash-in-hand	-	-	90,741.70
		By Bank Balance with UBI	-	-	1,07,84,861.56
		By Cash with UBI (Trainees Account)	-	-	4,50,229.41
		Pension Fund			
		Bank Balance	-	-	6,21,828.00
		Kisan Vikas Patra	-	-	14,50,000.00
		G.P.F.			
		Bank Balance	-	-	7,32,924.03
		Kisan Vikas Patra	-	-	30,00,000.00
Total	7,58,32,152.02		89,20,223.00	4,26,28,459.06	7,58,32,152.02

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

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

Sd/-
(S.K.Mukherjee)
Director.

INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDING 31ST MARCH, 1996.

EXPENDITURE		INCOME		
To salaries and allowances	87,01,447.00	By Grant-in-aid Deptt. of Env. & Forests, New Delhi.	4,35,00,000.00	
To Leave Salary & Pension Contribution	38,379.00	Less transferred to Capital Expenditure	2,75,93,410.90	1,59,06,589.10
To Bonus	2,56,479.00	By Gant-in-Aid accrued but not received		35,00,000.00
To Honorarium	1,39,771.00			
To Fellowship	8,00,752.00	By Training Cost	7,99,554.00	
To Wages	4,35,479.74	Other receipts	13,140.00	8,12,694.00
To Travel Expenses	12,80,375.50			
To Newspapers & Magazines	25,693.00			
To Publicity & Advertisement	1,38,614.00	By Interest on Training Account		12,640.00
To Operational Expenses	37,25,021.00	By special Diploma Course (Srilanka)		21,04,320.00
To Stationery	5,04,977.00	By Interest on Bank Deposits		3,92,729.00
To Rent for Hired Buildings	1,26,839.00	By Penal Interest		313.00
		By Miscellaneous Receipts		3,21,832.00
To Postage & Telegram	1,34,481.00	By Training cost accrued but not received		7,01,460.00
To Sports Goods	30,906.00	By W.I.I. Receipts (Institutional charges)		57,084.00
To Telephone & Trunk calls	8,76,979.00	By Nanda Devi Biosphere Reserve Project		96,000.00
To Conveyance	13,526.00	By M.Sc. Course Fees		6,93,810.00
To Electricity & Water charges	16,13,131.67			
To Entertainment	58,168.00			
To Printing & Binding	35,551.00			
To Repair & Maintenance of office equipment	17,818.00			
To Govt. contribution to Pension Fund	10,48,000.00			
To L.T.C.	67,751.00			
To Audit Fee	6,450.00			
C/F	2,00,76,588.91	C/F		2,45,99,471.10

EXPENDITURE		INCOME	
B/F	2,00,76,588.91	B/F	2,45,99,471.10
To Insurance (Research fellows and Faculty Members)	15,268.00		
To Stipend	67,015.00		
To Over Time Allowence	86,563.00		
To Legal Expenses	15,750.00		
To Training Cost	32,19,817.00		
To Repair & Maintenance of vehicles	4,81,744.00		
To POL for vehicles	7,44,967.00		
To Lab Chemicals	41,600.00		
To Exhibition	88,697.00		
To Estate Maintenance	10,70,335.00		
To Land Scaping	5,92,715.00		
To Publication	3,32,107.25	Excess of Expenditure Over income	23,16,646.06
To Uniform	66,090.00		
To refund of Tender Cost	16,860.00		
Total	**2,69,16,117.16**	**Total**	**2,69,16,117.16**

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

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

Sd/-
(S.K.Mukherjee)
Director.

BALANCE SHEET AS ON 31ST MARCH 1996

FUNDS & LIABILITIES	As on 31.3.95 Amount Rs. Ps.	Addition during 1995-96 Amount Rs. Ps.	As on 31.3.96 Amount Rs. Ps.
Excess of income over expenditure	1,93,23,717.99	(-)23,16,646.06	1,70,07,071.93
Pension Fund	17,92,493.00	2,79,335.00	20,71,828.00
G.P.Fund	32,17,250.03	5,15,674.00	37,32,924.03
Amount capitalised	13,88,57,508.13	2,75,93,410.90	16,64,50,919.03
CGEGIS Refund	15,306.00	54,250.90	69,556.90
Income Tax salary	-	7,900.00	7,900.00

ASSETS	As on 31.3.95 Amount Rs. Ps.	Addition during 1995-96 Amount Rs. Ps.	As on 31.3.96 Amount Rs. Ps.
Land	66,07,214.65	—	66.07.214.65
Trees	24,32,709.00	—	24.32.709.00
Avenue Plantation	20,31,169.15	3,03,407.00	23.34.576.15
Campus Development	25,02,117.31	4,30,960.00	29.33.077.31
Lab Eqpt	12,61,474.07	---	12.61.474.07
Furniture & Fixture	66,37.317.69	2,92,260.00	69.29.577.69
Vehicles	48,89.987.21	3.04,703.00	51.94.690.21
Library Books	55,09,886.28	9,36,258.00	64.46.144.28
office Eqpt	27,94,365.90	2,24,815.00	30.19.180.90
Camp Eqpt	3,92,145.34	1,03,092.00	4,95.237.34
Photographs and Photo Material	8,97,951.20	1,59,007.00	10.56.958.20
Educational films	10,59,107.35	12.275.00	10.71.382.35
Journals & Periodicals	50,70,577.10	22,41,229.90	73.11.807.00
Material & Supplies	38,63,727.95	-	38,63.727.95
C/F			5,09,57,757.10

C/F 18,93,40,199.89

FUNDS & LIABILITIES				ASSETS			
B/F			18,93,40,199.89	B/F			5,09,57,757.10
Sales Tax from contractor	-	40,661.00	40,661.00	Training Eqpt	1,17,49,608.24	20,56,284.00	1,38,05,892.24
Income Tax from contractors	-	43,438,.00 (-) 13,289.01	30,148.99	Boundary wall Block I & Gate	14,46,200.59	-	14,46,200.59
				Bounday Fencing	8,17,934.93	--	8,17,934.93
Security deposit	16,05,548.95	(-) 2,55,039.00	13,50,509.95	Building complex	6,56,36,856.00 (-) 1,195.00	1,87,26,186.00	8,43,61,847.00
Withheld amount	2,35,725.00	(-)3,932.00	2,31,793.00	Archi tectural & Supervision fee	36,67,231.85	14,46,022.00	51,13,253.85
Security deposit (Hostel)	2,500.00	-	2,500.00	D.G Set	7,15,126.00	-	7,15,126.00
PLI Premium	-	19.00	19.00	EPABX	11,76,484.00	-	11,76,484.00
Publication of Book for Central Zoo Authority	2,05,000.00	-	2,05,000.00	A.C. Plant	25,97,452.00	---	25,97,452.00
G.P. Fund	-	1,382.00	1,382.00	Advance for expenses for training	2,52,802.00	(-) 2,52,802.00 (+) 28,584.00	28,584.00
Remittance due Receipt from Director Rajaji National Park for Elephant Action Plan Workshop to be held in June 96.	-	75,000.00	75,000.00	Advance to staff (for expenses)	1,19,550.74	7,22,244.26	8,41,795.00
				Loan & Advance to Staff	12,84,297.20	(-)1,35,652.00 (+) 60,724.00	12,09,369.20
				Staff Quarters	31,75,520.00	-	31,75,520.00
				Road & Culverts	6,21,018.00	2,74,989.00	8,96,007.00
				Tennis Courts	5,30,852.32	-	5,30,852.32
				To closing stock of Steel, Cement and wood	19,01,845.90	(-) 7,74,968.00 (-) 4,456.00	11,22,421.90
				Grant-in-Aid accrued but not received	-	-	35,00,000.00
		C/F 19,12,77,213.83				C/F 17,22,96,497.13	

FUNDS & LIABILITIES		ASSETS			
B/F	19,12,77,213.83				
		B/F			17,22,96,497.13
		Auditorium	7,74,669.00	81,923.00	8,56,592.00
		Income Tax	13,289.01	(-)13,289.01	-
		Contractor			
		Closing Bank Balance (Training Account)	-	-	4,50229.41
		Closing Bank Balance	-	-	1,07,84,861.56
		Closing Cash Balance	-	-	90,741.70
		F.D.R.	25,00,000.00	(-)25,00,000.00	-
		Pension Fund			
		(i) Bank Balance	3,42,493.00	2,79,335.00	6,21,828.00
		(ii) Kisan Vikas Patra	14,50,000.00	-	14,50.000.00
		.G.P. Fund			
		(i) Bank Balance	2,17,250.03	5,15,674.00	7,32,924.03
		(ii) Kisan Vikas Patra	30,00,000.00	-	30,00.000.00
		Training Cost accrued but not received	6,92,080.00	(-)4,00,000.00 (+)7,01,460.00	9,93,540.00
Grand Total	**19,12,77,213.83**	**Grand Total-**			**19,12,77,213.83**

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

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

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

Sd/-
(S.K.Mukherjee)
Director.

PERMANENT ASSETS AS ON 31.3.1996

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	-	2432,709.00
3.	Avenue Plantation	20,31,169.15	3,03,407.00	23,34,576.15
4.	Furniture & Fixture	66,37,317.69	2,92,260.00	69,29,577.69
5.	Lab Equipment	12,61,474.07	-	12,61,474.07
6.	Office Equipment	27,94,365.90	2,24,815.00	30,19,180.90
7.	Training Equipment	1,17,49,608.24	20,56,284.00	1,38,05,892.24
8.	Camp Equipment	3,92,145.34	1,03,092.00	4,95,237.34
9.	Photographs & Photo-graphic material	8,97,951.20	1,59,007.00	10,56,958.20
10.	Educational films	10,59,107.35	12,275.00	10,71,382.35
11.	Library Books	55,09,886.28	9,36,258.00	64,46,144.28
12.	Journals & periodicals	50,70,577.10	22,41,229.90	73,11,807.00
13.	Materials & Supply	38,63,727.95	-	38,63,727.95
14.	Vehicles	48,89,987.21	3,04,703.00	51,94,690.21
15.	Campus development	25,02,117.31	4,30,960.00	29,33,077.31
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.	6,56,36,856.00 (-)1,195.00	1,87,26,186.00	8,43,61,847.00
19.	Architectural fee, Supervision & completion	36,67,231.85	14,46,022.00	51,13,253.85
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	6,21,018.00	2,74,989.00	8,96,007.00
25.	Tennis Court	5,30,852.32	-	5,30,852.32
26.	Auditorium	7,74,669.00	81,923.00	8,56,592.00
	Total	**13,88,57,508.13**	**2,75,93,410.90**	**16,64,50,919.03**