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DIRECTOR'S NOTE

The annual report of Wildlife Institute of India (WII) for the year 1999-2000 is a very special one as during the reporting period the Evaluation Committee appointed by WII-Society in January, 1998 submitted its report to the President of WII Society. The President, WII Society gave the responsibility to the Governing Body of the Institute, to workout actionable points which will set the agenda for the Institute's role in the field of wildlife and biodiversity conservation in the coming years.

The Institute submitted a proposal for obtaining a Deemed University status, which was one of the requirements as per Article of Association & Memorandum of the Institute, to the Ministry of Human Resource Development (MoHRD), Government of India through the administrative Ministry of Environment & Forests (MoEF). I am happy to report that MoEF and MoHRD, State Government of Uttar Pradesh and the All India Council of Technical Education have recommended the case to the University Grants Commission for subsequent examination.

During the year WII organized a national level workshop in collaboration with Lal Bahadur Shastri National Administration Academy on Eco-regional planning. This was attended by a wide range of decision-makers from national, regional, local level and Non-Governmental Organizations. The participants of this workshop came up with several workable recommendations, to be implemented by Protected Area managers. Similarly, a "Training Workshop on the use of Satellite Telemetry Technology" was organised in collaboration with BNHS, IISc, SACON and Department of Wildlife Science, AMU. The Ministry of Environment & Forests and Fish & Wildlife Service of United States sponsored this workshop. The workshop was well received and based on the feedback we feel very confident that use of this technology is now possible in India to understand more about long ranging migratory animals. Such information will help in making good conservation plans for several of our migratory species; particularly across trans-boundaries.

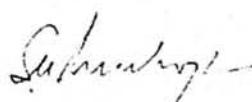
The Institute completed two major research projects: one at Great Himalayan National Park (GHNP), Himachal Pradesh and the other at Kalakad Mundanthurai Tiger Reserve (KMTR), Tamil Nadu. Sponsored under the Forest, Research, Education & Extension Project (FREEP) it had been a professionally rewarding experience working very closely with committed field biologists and park managers, large number of NGOs and individuals. A benchmark study report has been compiled for these two sites which in a way has become a land mark study for research in Protected Areas in India.

Some of the publications brought out by the Institute were, 'ENVIS Bulletin V. II (1) on Indian Crocodilians' and 'Bibliography on Wildlife & Protected Area Management in Madhya Pradesh' and also two WII-USFWS Project reports on 'Indian Giant Squirrel and Himalayan Ibex'.

The construction of new institutional block was completed during the year and this has provided the much needed space for accommodating the growing activities of the Institute.

The Institute has been consciously maintaining a certain focus and format of its annual report for all these years. We have been receiving some feedback from the readers. However, we would like to get more suggestions from our readers in order to further improve its quality.

I take this opportunity to thank all my colleagues, staff and a large number of well wishers with whose help the Institute has been steadily progressing in achieving its mandated role and responsibilities.


S.K. MUKHERJEE

YEAR AT A GLANCE

In the reporting year the Institute moved steadily towards achieving its goal of strengthening wildlife conservation, nationally as well as globally. The Institute made progressive efforts in the field of teaching, training and research in Wildlife Management and Biodiversity Conservation. For the first time, WII could administer the entrance tests for admission in its M.Sc. Course to foreign candidates in Sri Lanka and Myanmar. The Institute also recruited eight new scientists in its faculty.

The Institute conducted 3 regular courses, 6 short courses and 6 workshops during the year 1999-2000. Over 500 participants and resource persons participated in these workshops, seminar and courses. Besides this, the Institute's faculty members also participated in a large number of workshops, seminars, conferences and meetings organised by other organisations.

WII organised a regional workshop on "Application of Satellite Telemetry for Wildlife Research and Management" in association with four other well-known institutes of the country. Training cum monitoring workshop was organised at Kalakad-Mundanthurai Tiger Reserve (KMTR), which was based on the ecological and socio-economic studies conducted in KMTR. Another significant workshop, conducted at the Institute's campus was "Control of Illegal Wildlife Trade in India". Two Orientation workshops for Wildlife Watch coordinators were conducted in collaboration with the WWF- India and Nehru Yuva Kendra Sangathan. Lal Bahadur Shastri National Academy of Administration, Mussoorie and WII jointly organised a workshop on Conserving Biodiversity in 21st century through Integrated Conservation and Development Planning on a Regional scale.

Research activities are an important component of the Institute's mandate. The Institute completed three research projects and initiated three projects. During the reporting year there were twenty three projects of which twelve were externally funded. In addition to this, three projects sponsored under World Bank funded Forestry Research, Education & Extension (FREE) Projects were also completed. One Ph. D. was awarded to the researcher of the Institute and six publications were brought out. In the Annual Research Seminar (ARS) of the Institute, a total of 26 papers were presented. In addition to WII faculty, students, trainees and researchers several academicians, conservationists and wildlife experts were invited to the ARS.

The entire computer network of the Institute was thoroughly tested by using TBC compliance testing software and the roll over to the year 2000 was smooth. Library and Documentation centre continued to provided a range of services viz. Books circulation, Database search request, Inter library loan, References query, Document delivery and Document procurement request.

WII's contingent participated in the VIII All India Forest Sport Meet held in Chennai and won one Gold medal and one Bronze medal. WII received a large number of national and international dignitaries during the year.

OUR MISSION

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

MAIN WORK PROGRAMME : 1999-2000

REGULAR TRAINING COURSES

- XX P.G.Diploma Course in Wildlife Management (September 1998-May, 1999)
- XXI P.G.Diploma Course in Wildlife Management (September 1999-May, 2000)
- XV Certificate Course (May 1, 1999-July 31, 1999)
- VII M.Sc. Wildlife (July 1999-June, 2001)

SHORT COURSES

- Interpretation and Conservation Education Course (August 2-11, 1999)
- Special Course in Wildlife Protection, Law and Forensic Science (September 21-October 1, 1999)
- One week Capsule Course in Wildlife Management for IFS Officers (December 20-24, 1999)
- Training Course on Environmental Impact Assessment (December 21-27, 1999)
- Endangered Species and Zoo Management Course (February 23-March 10, 2000)
- Two week Capsule Course in Wildlife Management for IFS Officers (February 28-March 10, 2000)

WORKSHOPS

- National Workshop on Conservation of Biological Diversity in the 21st Century through Integrated Conservation and Development Planning on a Regional Scale (June 28-30, 1999)
- Orientation Workshop for Wildlife Watch Coordinators (November 12-16, 1999)
- Training Workshop on Wetland Research Methodology (December 5-10, 1999)
- Regional Workshop on Application of Satellite Telemetry for Wildlife Research and Management (December 13-19, 1999)
- Training cum Monitoring Workshop at KMTR (February 22-24, 2000)
- Workshop on Control of Illegal Trade in India (February 23-25, 2000)

SEMINAR

- XIII Annual Research Seminar (October 26-27, 1999)

MEETINGS

- IV Training, Research and Academic Council (TRAC) (October 25, 1999)
- XXXV Governing Body Meeting (November 18, 1999)
- WII-Society Meeting (January 4, 2000)
- V Finance Committee (March 11, 2000)
- IUCN-Regional Conservation Forum Meeting (March 22-25, 2000)

BACKGROUND

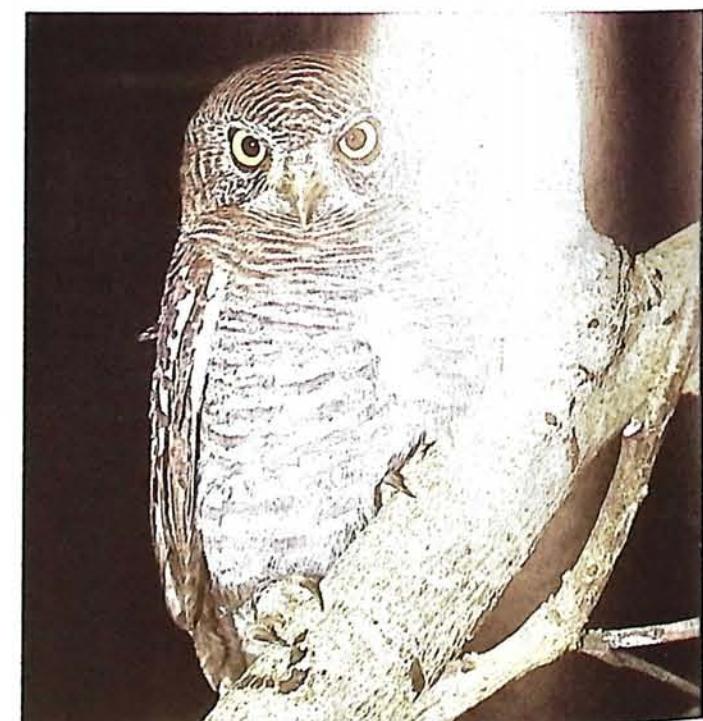
India is a country where flora and fauna have been worshipped since time immemorial. But as the civilization developed, human beings started exploiting natural resources for their survival and comfort. They did not care about the flora and fauna that came earlier than human beings on earth.

Conservation of forest resources was not a focussed activity for a long time, since the economic considerations prevailed. After India's independence, a need was felt to have a comprehensive conservation management strategy. The focus shifted from pure economics to a holistic look at our natural resources primarily aimed at conservation and also to protect the interest of the people who are dependent on these resources. Such a strategy led to the setting up of Wildlife Institute of India (WII) at Dehradun in 1982 with a mandate to train the stakeholders in conservation, carry out research and advise on matters of conservation and management of wildlife resources. The task was not easy but dedicated team efforts and admirable support of the government converted the dream into a reality.

WII's programmes being mainly field based and conducted throughout the country help its faculty and technical staff in keeping abreast with the field situation and incorporate new learning in its teaching and training programmes. This also helps in seeking an integration of biological, ecological, socio-economic and human dimensional aspects over large regional landscapes. Working through bilateral cooperation and collaborations with national and international agencies, the Institute's horizon has become broad based. This has resulted in a strong institutional infrastructure, abreast with thorough knowledge and latest technology. This recognition of the Institute's growing potential has encouraged UNESCO to declare WII as a regional training centre and the neighbouring countries from South and South-East Asia to send their professionals for training in natural resource management.

WII's OBJECTIVES

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



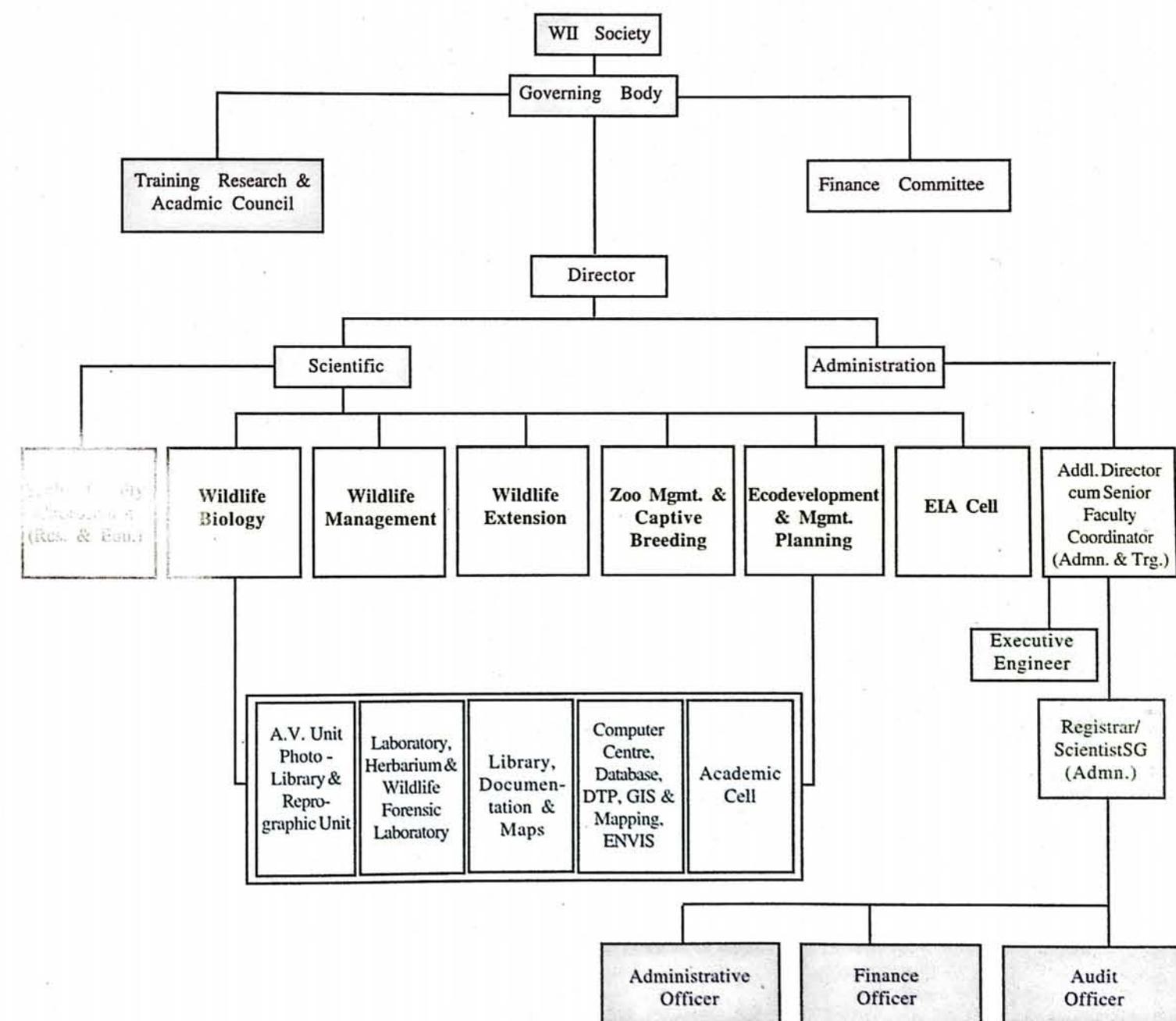
Barred jungle owllet.

INSTITUTIONAL INFRASTRUCTURE

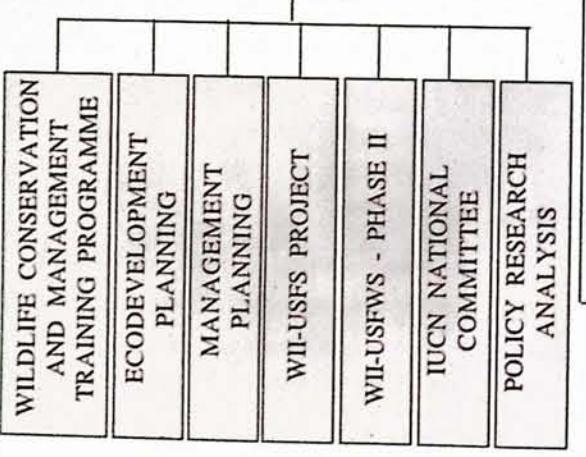
There are three faculty divisions at WII - Wildlife Biology, Wildlife Management and Wildlife Extension, besides two units, namely Ecodevelopment Cell and the EIA Cell. Providing support are Library and Documentation Centre, Computer Centre, Laboratory, Herbarium and an Audio-Visual Unit.

The charts below depict WII's organisational and scientific infrastructure.

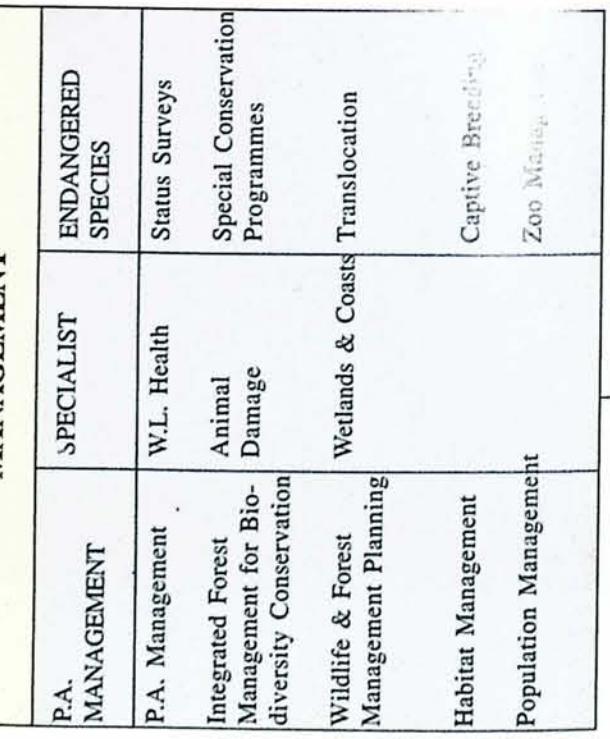
ORGANISATIONAL STRUCTURE - ADMINISTRATIVE



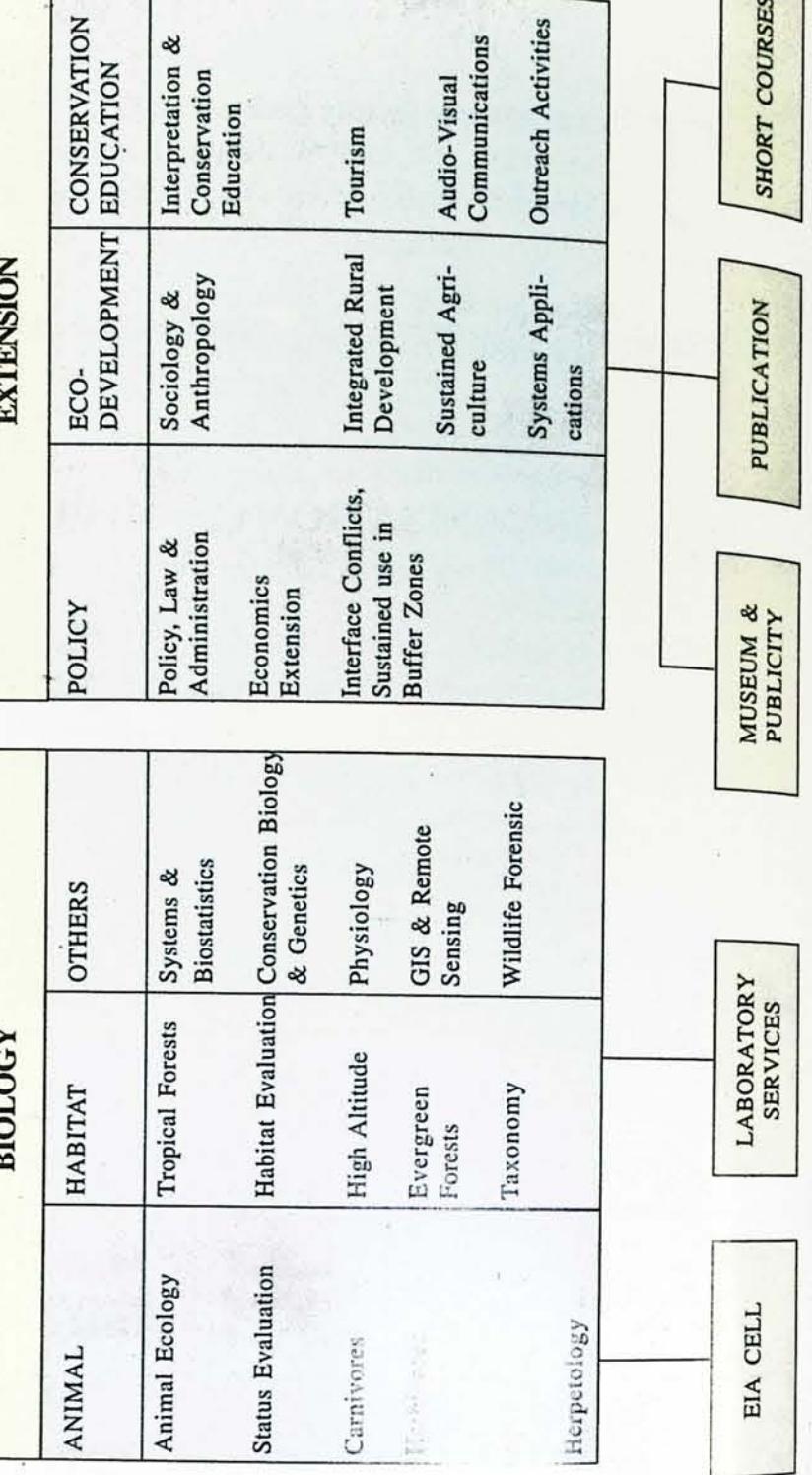
ORGANISATIONAL STRUCTURE - SCIENTIFIC



MANAGEMENT



BIOLOGY



EXTENSION

ADMINISTRATION

LIBRARY

COMPUTER & DATABASE SYSTEMS MANAGEMENT

TRAINING

RESEARCH & EDUCATION

MUSEUM & PUBLICITY

PUBLICATION

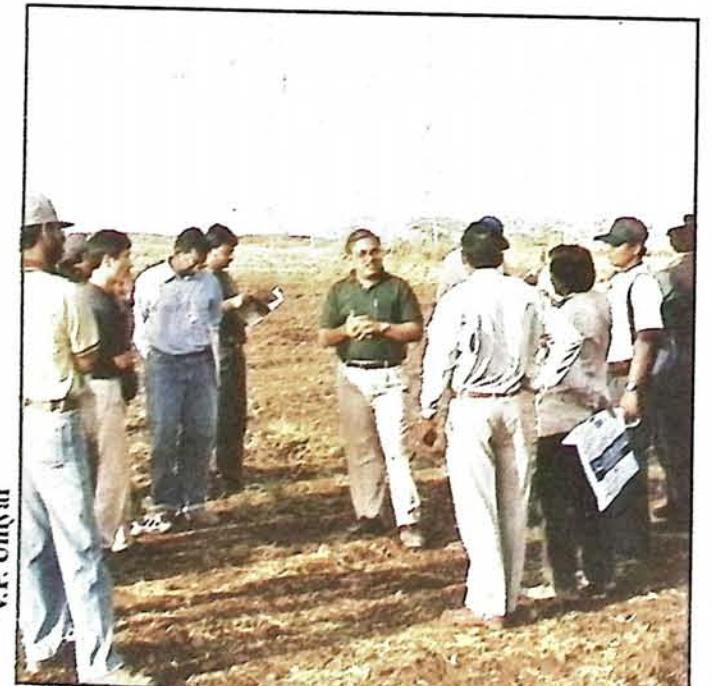
SHORT COURSES

Academic

TRAINING PROGRAMME

Post Graduate Diploma in Wildlife Management

The XX Post Graduate Diploma Course commenced on September 1, 1998 and concluded on May 31, 1999. Twenty (20) Officer Trainees (13 forest officers from different States/UTs within the country and 7 foreign nationals - 6 from Sri Lanka and 1 from Nepal) participated. A month-long module (March 15-April 12, 1999) on Ecodevelopment for Biodiversity Conservation was conducted as a part of Diploma Course, which allowed 4 lateral entrants in addition to 20 officers. Field visit formed an important component of the module. The lateral entrants were taken to Nagarjunasagar-Srisailam Tiger Reserve for field visit. The inputs for the same to the Diploma Course Trainee Officers were provided in Dudhwa Tiger Reserve along with management planning exercise from April 17, 1999 to May 5, 1999. The Institute's Gold Medal for the 'Top Trainee' was awarded to B.Srinivas; Director's Award for 'Second Top Trainee' to Kumar Manish Arvind; Wildlife Preservation Society Medal for 'Top Trainee' to B.Srinivas; Award for the Top Trainee in 'Wildlife Ecology & Behaviour' to M.G.C.Sooriyabandara; Award for the Top Trainee in 'Wildlife Management' jointly to



VP Unival

Diploma trainees visited the site for fodder development in village Dhanej near Gir Conservation Area in Gujarat during their term paper exercise.

Arvinder Singh and A.Baruah; N.R.Nair Memorial Medal for the 'Best Management Plan' to C.L.Das and the Award for the 'Best All Round Wildlifer' also to C.L.Das. The awards were given away by Shri Samar Singh, Secretary General, WWF-India.

The XXI Post-Graduate Diploma Course in Wildlife Management commenced from September 1, 1999 in which 14 officer trainees (8 forest/wildlife officers from different states within the country; one each from Nepal, Bangladesh and Sri Lanka sponsored under SAARC fellowship and one each from Sri Lanka, Palestine and Kazakhstan under fellowship of ITEC Scheme) participated. Module on Ecodevelopment for Biodiversity was conducted from January 10-February 7, 2000. In this module 6 officers joined as lateral entrants. The lateral entrants were taken to Nagarjunasagar-Srisailam Tiger Reserve for field visit while the inputs for the same to the Diploma Course Trainees were provided in Periyar Tiger Reserve and Kanha Tiger Reserve alongwith Management Tour. The Orientation Tour was conducted at Saneh, Kolhuchaur and Sonanadi Wildlife Sanctuary. The Techniques Tour was conducted at Rajaji National Park. The Management Tour was conducted in Mudumalai Wildlife Sanctuary, Bandipur Tiger Reserve, Mukurty National Park, Kanha Wildlife Sanctuary, Parambikulam Wildlife Sanctuary, Eravikulam National Park, Periyar Tiger Reserve, Gulf of Mannar Marine Reserve, Kanha National Park and Kaziranga-Ghana National Park. The Guindy National Zoological Park, Snake Park, Vandalur Zoo and Madras Crocodile Bank were also visited. The Management Term Paper Exercise is to be conducted at Gir Conservation Area, Gujarat. The course is scheduled to conclude on May 31, 2000.

XV Certificate Course in Wildlife Management

The XV Certificate Course in Wildlife Management started on May 1, 1999 with seventeen officers (including 3 foreign nationals - 2 from WWF-Pakistan and one from

Singapore). Of the 14 Indian candidates, 3 were from Madhya Pradesh, 2 each from A&N Islands, Chandigarh, Kerala and Maharashtra and 1 each from Lakshdweep, Dadra & Nagar Haveli and Uttar Pradesh.

The trainees were given inputs in the subjects related to biodiversity conservation, biology of major vertebrates, principles of wildlife management, law, tourism and ecodevelopment. Besides regular lectures, which involved classroom interaction, small assignments, group discussions, case studies and workshops, the trainees were taken to Rajaji National Park during May 17-30, 1999 and were given field demonstration of various techniques such as census methods, vegetation sampling and pressure assessments. To expose the trainees with the magnitude of conservation management problems faced by protected areas of India and the methods of tackling those problems, field tour to Nagarhole-Bandipur-Mudumalai Conservation area was undertaken during June 7-30, 1999. The Final Term Examination of the officer trainees was conducted during July 22-26, 1999. All the trainees have successfully completed the course.

STAFF COURSES

Interpretation and Conservation Education Course, August 2-11, 1999. The Interpretation and Conservation Education Course was organised by the Wildlife Institute of India at its Sandrabani campus. The course was designed to meet the needs of staff from national parks, sanctuaries, zoos, environment and development projects, defence services, wildlife tourism agencies and NGOs requiring assistance in the development of education awareness programmes. The objectives of the course were: (i) To orient the participants to appreciate the need for environment awareness and education; (ii) To understand the value of using basic interpretive principles in disseminating conservation awareness; (iii) To use interpretation as a management tool; (iv) To expose them to a range of communication techniques; (v) To enhance awareness and understanding of environmental issues and (vi)

To provide them minimal ability to pass on acquired skills and knowledge to others. A total of 19 participants from national parks, sanctuaries, zoos and NGOs participated in the course.

Special Course in Wildlife Protection, Law and Forensic Science, September 21 - October 1, 1999. A two-week special course in wildlife protection, law and forensic science was organized for probationers of Indian Customs & Central Excise Service Group 'A'. Twenty-two probationers of the 51st batch of ICCES participated in the training course. The course was aimed at sensitizing the custom officials about wildlife trade related issues during their initial training phase so that they can effectively enforce laws related to control of illegal trade in wildlife and wildlife products. The course participants were taken on a field visit to Sariska and given hands on exercises to develop skills for identification of wild animals/wildlife products and basic wildlife forensic science.

One Week Capsule Course in Wildlife Management, December 20-24, 1999. As part of the compulsory training programme for IFS Officers this course was organised at WII. There were seventeen participants from eight states. The basic objective of the course was to orient forest managers to broad principles of wildlife management and their relevance to mainstream forestry. The management rationale was tested by arguments based on economics, social and cultural aspirations, and the necessity to develop synergy between the seeming forces under an over arching ecological perspective. The key to conservation of the variety and variability of life forms is in managing meta-populations across landscapes and regions. The need for attracting different players to constitute a team is the lynchpin. This course was designed around interactions with participants. Several field examples, case studies, events and ground realities were used to provoke discussions. A daylong field visit to the Rajaji National Park was slated to discuss a variety of issues - biological, social, economic, ecological, legal and administrative. The course concluded with a feed back session with Director WII and other senior faculty members of the Institute.

Vinod Verma

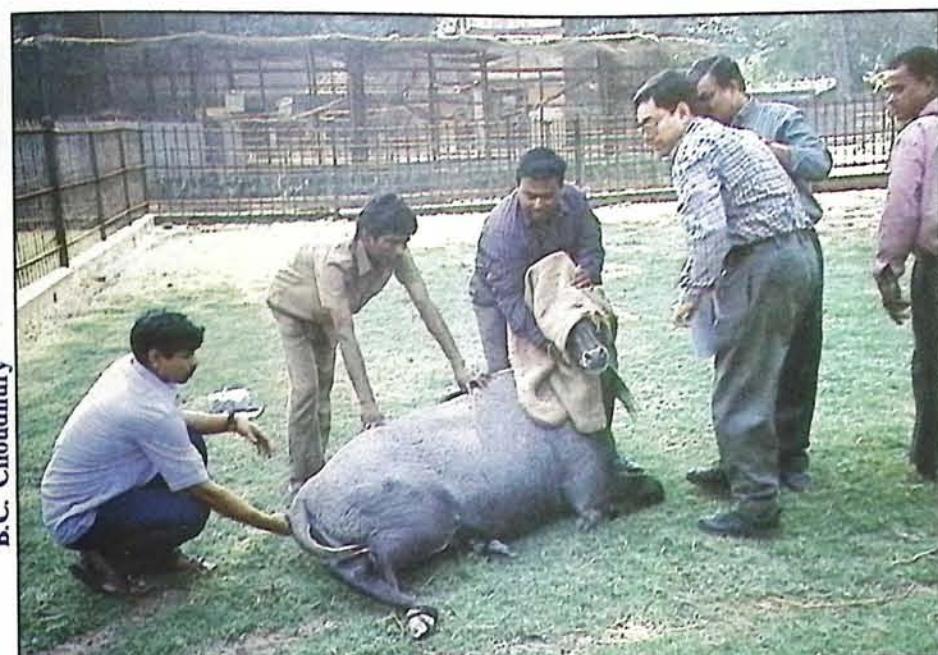


Participants of one week capsule course being exposed to use of GIS and remote sensing in wildlife conservation.

Training course on Environmental Impact Assessment, December 21-27, 1999. A five-day training course was organised at WII alongwith the EIA Module for the Diploma course. The course had eighteen (18) lateral entrants. The course provided participants a broad understanding of the principles of EIA, enhanced their capabilities and skills to plan, conduct and review impact assessments of development projects independently. The course also provided insights into impact identification and mitigation planning approaches and provided opportunity for sharing information and experience so as to ensure incorporation of biodiversity conservation concerns in developmental projects.

The X Endangered Species and Zoo Management Course February, 23-March 10, 2000. This course was conducted by the Wildlife Institute of India and sponsored by Central Zoo Authority at Alipore Zoological Garden, Calcutta and Nandankanan Zoological Park, Bhubaneshwar for middle level professional. This course was conducted as a part of the series of courses conducted by WII in its efforts to train zoo professionals in modern techniques and concepts pertaining to *ex-situ* management of animals especially endangered species. A stud book module was

also introduced for the first time and this dealt with issues related to the maintenance of studbooks in the zoos. Shri Arin Ghosh, IFS, Chief Wildlife Warden, West-Bengal and Shri P.R. Sinha, Member Secretary, Central Zoo Authority inaugurated the course on September 23, 1999 at Alipore Zoological Garden, Calcutta. Nineteen (19) trainees attended this course from State Forest Departments. During the course, field visits were made to two high altitude zoos, Himalayan Zoological Park, Gangtok, Sikkim and Padmaja Naidu Zoological Park, Darjeeling. During these visits the trainees evaluated snow leopard and red panda breeding centres at Darjeeling and also looked at enclosure designs. In the module dealing with studbooks, three zoo directors and official studbook keepers; Ms. Mamta Sharma, Director, Kanpur Zoo (One Horned rhinoceros), Shri N. Krishnakumar, Director, Arignar Anna Zoological Park, Chennai (Lion Tailed Macaque), Shri R.C. Bhattacharjee, Director, Assam State Zoo (Golden Langur) participated and gave lectures. These lectures were based on their experiences in maintaining studbooks and they clearly laid out the problems and constraints faced by them. The valedictory function was held at the Nandankanan Zoological Park, Orissa on March 10, 2000. Shri D.S. Patnaik, CWLW, Orissa alongwith Shri



Zoo Management Course is conducted with a mandate to train zoo professional in modern techniques of animals especially endangered species.

B.C. Prusty, Director, Nandankanan Zoo, Orissa addressed the participants during the valedictory function and distributed the certificates to the participants.

Two-Week Capsule Course in Wildlife Management for IFS Officers, February 28-March 10, 2000. As part of the compulsory training of IFS officers, the MoEF sponsored the course, which was organised at WII. Twelve trainees from Andhra Pradesh, Gujarat, U.P., Bihar, Jharkhand and Tamil Nadu participated in the course. The basic aim of the course was to acquaint Protected Area Managers and other forest officials who had not had the benefit of formal training in the subject with principles and practices of wildlife management. The participants included DCFs, CFs and CCFs.

The participants were taken on a three-day visit to Corbett National Park where they had an opportunity to discuss wildlife issues with PA managers and Chief Wildlife Warden of U.P.

advertisement in major national dailies and also hosted on the Institute's website. Twelve candidates were admitted to this course which include two foreign candidates. For the first time, WII could administer the Entrance Tests for foreign candidates in Sri Lanka and Myanmar.

The VII M.Sc. course began on July 19, 1999. The students underwent their field orientation at Koluchaur, Morni Hills Pheasantry and Chatbir Zoological Park. The Techniques Tour was conducted at Sariska Tiger Reserve. Semester I was completed during the first week



Students of VII M.Sc. course in Wildlife Science undergoing orientation tour at Koluchaur near Corbett N.P.

S. Sathyakumar

of December 1999. After the winter vacation, Semester II (January to May) began on January 19, 2000 and teaching and training inputs for the various course units were conducted. The students underwent their techniques and conservation practice tours to Keoladeo National Park, Bharatpur during January 2-8, 2000 and National Chambal Sanctuary, Ghatigaon WS, Madhav NP, GIB Sanctuary in Karera and Van Vihar in Bhopal during March 3-12, 2000. The Semester II exams are scheduled for June 2000.

WORKSHOPS, SEMINARS, CONFERENCES AND MEETINGS

Organised by WII

Conserving Biodiversity in 21st Century through Integrated Conservation and development Planning on a Regional Scale, June 28-30, 1999. Given the basic premise that a new paradigm of development needs to be strongly rooted in the conservation concerns, this workshop was organised for senior policy makers at Lal Bahadur Shastri National Academy of Administration (LBSNAA) Mussoorie in collaboration with Wildlife Institute of India. In this workshop, which was inaugurated by Shri N.N.Jha, former Ambassador, a number of subject areas were discussed. These included the Conservation of Biodiversity in the Protected Areas, Forested Landscapes outside the Protected Areas and Wetlands. Important issues for Biodiversity Conservation like Social Equity, Economic Development were also the subjects of discussion. This was followed by experience-sharing sessions of Watershed Management, Joint Forest Management, Ecodevelopment, Remote Sensing as a tool for Biodiversity Conservation Planning. Based on all these discussions, the participants worked in small groups to evolve important workshop recommendations for biodiversity conservation at the regional scale. This workshop was attended by about 70 participants, which included some members of Parliament, senior civil servants of Central and State Governments, NGOs and practitioners in the field of wildlife

management and biodiversity conservation. Prof. P.M. Shingi of Indian Institute of Management, Ahmedabad, co-ordinated various sessions of the workshop. Shri H.S. Panwar, former Director, WII guided the session on Eco-regional Planning. Shri C.P. Oberoi, IG (Forests), Dr. M.K. Ranjit Singh, Dr. Vandana Shiva, Shri Ashish Kothari, Shri Anna Hazare, Dr. Vinay Sinha, Dr. Biplab Das Gupta (Member, Rajya Sabha), Shri S. Rizvi (WWF) and Shri V.B. Saharia were some of the important contributors in the workshop, in addition to the faculty members of WII, LBSNAA and other participating organisations. The workshop came out with a number of critical recommendations, to chart out a road map for sustainable development in the next millennium.

The XIII Annual Research Seminar (ARS), October 26-27, 1999. Shri J.C. Daniel, Chairman TRAC, chaired the seminar. The faculty and researchers of the Institute presented a total of 26 papers. More than 200 delegates from all over the country and few delegates from foreign countries including USA, Palestine, Nepal, Sri Lanka, Bangladesh and Myanmar attended the ARS. As a part of this ARS, Dr. Herbert Raffaele, Chief of the Office of International Conservation in the U.S. Fish & Wildlife Service, gave a pre-dinner talk "Scientists as conservationists: Are we still in the Dark Ages?"

The following were adjudged as the top five presentations:

Name	Topic of Presentation
Bivash Pandav	Conservation and management of Olive Ridley Sea Turtles (<i>Lepidochelys olivacea</i>) in Orissa.
Kartik Shanker	Conservation genetics of the Olive Ridley on the East Coast of India.
K. Vasudevan	Are remnant rainforest fragments in the Western Ghats important for amphibians?
N.M. Ishwar	Does rainforest fragmentation affect reptile species richness - A case study from Anamalais.
K.S. Gopi Sundar	The Sarus Crane in India - an update.

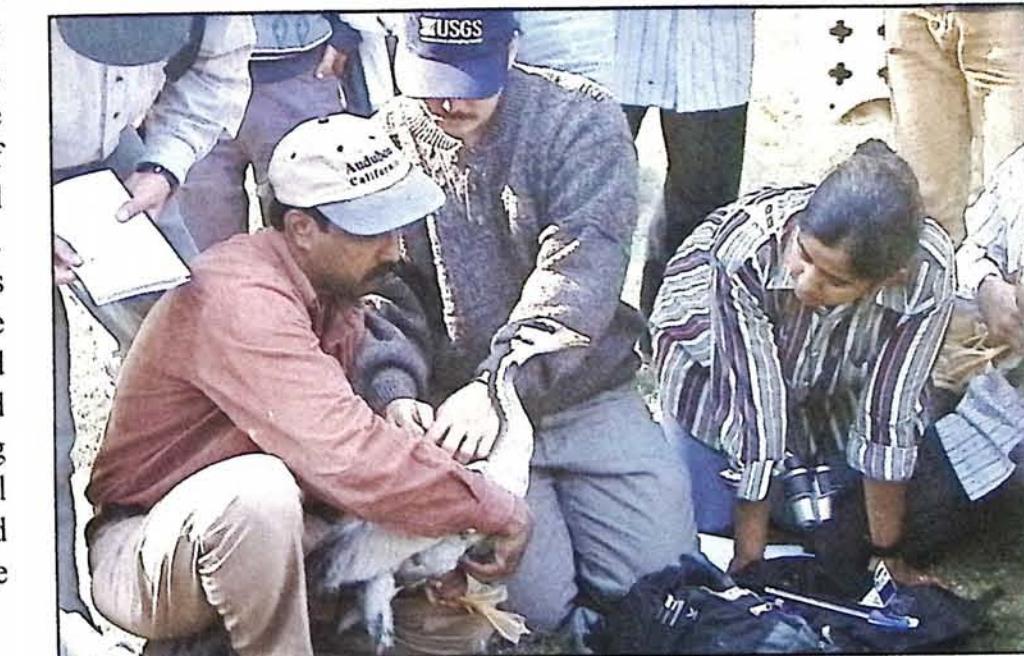
All the five researchers were given book awards worth Rs. 750/- each.

II & III Orientation Workshop for Wildlife Watch Coordinators, November 12-16, 1999. The Wildlife Institute of India in collaboration with the WWF-India and Nehru Yuval Kendra Sangathan (NYKS) organized two WWF-India sponsored 2-day orientation workshops for Wildlife Watch Coordinators at Dehradun. The Wildlife Watch programme has been launched by WWF-India in collaboration with NYKS to mobilize the vast countrywide network of Nehru Yuval Kendras for generating awareness regarding wildlife issues, mobilizing local action, creating links with the national agencies and collection of information on wildlife. Over thirty youth coordinators from UP, Haryana, Rajasthan, Punjab, HP and J&K participated and were given exposure to the issues related to biodiversity conservation including legal issues and trade in wildlife, environmental awareness, planning and monitoring.

Training Workshop on Wetland Research Methodology, Bhubaneswar, December 5-10, 1999. The Wildlife Institute of India organized a training workshop on "Wetland Research Methodology" at the Chilika Lake, Orissa, RAMSAR Site. The workshop was aimed to familiarize wetland researchers and managers with specific methods of wetland research and monitoring. The participants ranged from university researcher, teachers and wetland managers. The lecture, discussion, field visit and interaction based training programme was the first of its kind by the Wildlife Institute in the field of wetland Protected Area management. S.A. Hussain besides being the Course Director coordinated the programme and facilitated obtaining the services of several wetland scientists and managers as resource persons.

Application of Satellite Telemetry for Wildlife Research and Management, December 13-19, 1999. This regional workshop was organised at Dehradun by the Wildlife Institute of India in association with Bombay Natural History Society (BNHS), Mumbai; Indian Institute of Science (IISc.), Bangalore; Centre for Wildlife & Ornithology, Aligarh Muslim University (AMU) and Salim Ali Centre for Ornithology & Natural Society (SACON), Coimbatore. In all 38 participants and 14 resource persons participated in the workshop. MoEF sponsored the workshop in collaboration with US Fish & Wildlife Service. The aim of the workshop was to familiarise wildlife research and management personnel of India and neighbouring countries with the application of Satellite Tracking Technology, which can serve as an important tool in wildlife studies for tracking animal movement. Field testing in Keoladeo Ghana National Park, Bharatpur followed the workshop. The participants included wildlife biologists, protected area managers, university researchers and teachers.

Training cum Monitoring Workshop at Kalakad Mundanthurai Tiger Reserve (KMTR), February 22-24, 2000. Based on the ecological and socio-economic studies conducted in Kalakad-Mundanthurai Tiger Reserve (KMTR) during 1996 to 1999, a 3-day monitoring cum training workshop was



Deploying Platform Transmitter Terminal on a bar headed gull in Keoladeo NP, Bharatpur.

KK Shrivastava

conducted at KMTR to have the feedback from the field staff, scientists and various stakeholders for developing the monitoring protocol. The objectives of the workshop were: (i) to present the initial results and baseline data of FREEP-KMTR project to the field staff, (ii) to discuss the broad methods and approaches of ecological monitoring, (iii) to identify the key species, habitat and socio-economic parameters for monitoring and (iv) to work out the feasibility and repeatability of monitoring protocols. The faculty from WII included Sanjay K. Srivastava (Nodal officer), A.J.T. Johnsingh, G.S. Rawat, B.K. Mishra and K. Sankar (Investigators). The workshop had good participation from all the field officials including Field Director, Dr. V.K. Melkani and Ecodevelopment Officer (EDO) Shri S. Dutt. In all 40 participants were present in the workshop. The issues and findings from the workshop deliberations have been incorporated in the final Monitoring Report.

Fifth Workshop on Control of Illegal Wildlife Trade in India, February 23- 25, 2000. This workshop was organised at WII. The workshop had eleven participants from Directorate of Revenue Intelligence, Foreign Post Office, Department of Forensic Science, CID Forest Cell, Central Forensic Science Laboratory, WPSI, National Academy of Customs, Excise and Narcotics and Forest Department. Special emphasis was given on wildlife trade in butterflies, reptiles, birds and mammals during the workshop. These workshops were initiated in 1995 as part of the implementations of the recommendations made by the Subramanian Committee on "Prevention of Illegal Trade in Wildlife and Wildlife Products".

Second Regional Conservation Forum (RCF) of IUCN, New Delhi, March 22-25, 2000. One specific aim of RCF-II was to generate discussion on conservation issues in the context of security in the new century. A welcome address by the Secretary, MoEF, also the chair of the Indian National Committee of IUCN, followed by a presentation by the Director-General of IUCN set the tone for the meeting. The Minister of Environment and Forests gave the inaugural address. Sub-regional and country presentations were made alongwith presentation

and panel discussions on Commission activities and donor groups were offered opportunity for integration. At the same time, extensive group discussions were held on IUCN's Regional Programme in Asia.

The delegates from the member organization of IUCN who met at the RCF-2000 in New Delhi discussed issues related on the main theme "Securing our future in Asia: the new century". Following a review of the work of various commissions of the IUCN as well as individual member organizations of the region, the delegates formed themselves into 4 major groups to develop a 3 year action plan for the Asian region to be presented in the forthcoming IUCN World Congress in Amman, Jordan in October, 2000. Major resolutions for Conservation Action on Indian Tiger, Tibetan Antelope, Gangetic Dolphin and the migratory marine turtles along the Indian coastline have been developed.

Workshops, Seminars, Meetings Attended by WII personnel

All India Zoo Directors Conference and Workshop on National Zoo Policy 1998, Kanpur, April 4-5, 1999. B.C. Choudhury and Bitapi Sinha participated in the "All India Zoo Directors Conference and the Workshop on National Zoo Policy 1998". This was organized to commemorate the 50th Jubilee year of the Kanpur Zoological Park. While B.C. Choudhury discussed the need for planned and coordinated breeding programmes in Zoos, Bitapi Sinha deliberated on the nuance of interpretation facilities in Zoological Parks to make a Zoo visit educative and fruitful.

Meeting of the Government of India's Steering Committee on Sal Borer, ICFRE, Dehradun, April 19, 1999. V.B. Sawarkar being a member of the Steering Committee constituted by MoEF, Govt. of India attended the meeting. The Director General, ICFRE, chaired the meeting. The Principal Secretary, Forests, Government of M.P. & CCF Development, M.P. presented the latest statistics. The trends indicated that the epidemic was declining. It

was decided to approach the Government to extend the term of the committee till December, 1999 so that a complete analysis and future mitigation could be recommended.

Workshop on Wetlands in Gujarat – Current status and conservation strategies for future, Baroda, April 30-May 1, 1999. Organised by the WWF-Gujarat State unit at Baroda, this workshop aimed at reviewing the Status of wetlands in Gujarat state and through a participatory approach to develop a conservation strategy. Invited by the organizers, B.C. Choudhury acted as a resource person and session chair and presented an overview of the importance of Gujarat Wetlands in supporting wetland floral and faunal diversity. Ranging from mangroves, coral reefs, man-made lakes and reservoirs the importance of wetland habitats in the arid zone was the focus of his presentation.

National workshop/consultative meeting organised by World Bank, New Delhi, May 26, 1999. A.K. Bhardwaj participated in this workshop/consultative meeting and contributed in framing the possible strategies of improving India-Ecodevelopment Programme. Various issues concerning the implementation of the project were discussed in this meeting.

National Seminar on Population, Development and the Environment, Dehradun, June 3, 1999. Ruchi Badola attended this seminar and contributed a paper on "Ecodevelopment-Conserving biodiversity by reaching out to the people."

International Association for Impact Assessment (IAIA) Annual Meeting, Glasgow, June 11-19, 1999. In this annual event of the IAIA, Asha Rajvanshi chaired the workshop on "Biodiversity issues in EIA". The workshop was organised for Capacity Building Grant (CBG) participants. V.B. Mathur presented a paper on "Mitigation Planning for Developmental Projects: Lessons Learnt from Indian Experience" and Asha Rajvanshi presented the paper "Strategic Environmental Impact Assessment of the India Ecodevelopment

Project: Experiences, Prospects and Lessons Learnt". V.B. Mathur and Asha Rajvanshi were awarded the Capacity Building Grant (CBG) by the International Co-operation Committee of the International Association for Impact Assessment (IAIA) and the Ministry of Foreign Affairs of the Netherlands for attending the IAIA Annual Meeting and the special program for CBG recipients in Glasgow. The International Cooperation Committee of IAIA awarded the "Certificate of Recognition" for outstanding contributions in IAIA '99 to Asha Rajvanshi and V.B. Mathur. The IAIA annual meeting provided a most befitting opportunity for initiating collaborative linkages between WII and the global EIA network.

Second ASEAN Symposium and Workshop on Sea-Turtle Conservation and Biology, Kota Kinabalu, Sabah, Malaysia, July 15-17, 1999. The Malaysian Government and the Convention of Migratory Species (CMS) Secretariat jointly organized a meeting of sea-turtle scientists, fisheries and wildlife management officials. The meeting was in two parts: The first part was an assessment of sea turtle status through scientific and management papers presented by various scientists and managers from the Asian region. B.C. Choudhury participated in the meeting and presented a paper titled "Sea-turtle Conservation Agenda of India". The second part of the meeting was to explore the possibility of development of an Inter-Asian Regional Convention on Sea-turtle conservation and management through participatory discussion amongst representatives of various countries of the region. Facilitated by the Convention on Migratory Species (CMS) the meeting laid the foundation stone for such a forum. Based on the Wildlife Institute of India's work on sea-turtle, B.C. Choudhury was designated to be the scientific focal point from the Indian region for future consultations in this regard.

Indian National Committee of IUCN Meeting, New Delhi July 16, 1999. S.K. Mukherjee attended first Indian National Committee of IUCN Meeting held at New Delhi.

VI International Rangelands Congress (IRC), Townsville, Australia July 19-23, 1999. Bitapi C. Sinha attended the VI IRC organised by the International Rangelands Society and presented a paper titled "An exotic mesquite (*P. juliflora*) - a threat for conserving habitat of endangered flagship species (Indian Wild Ass) of salt desert ecosystem in Western India".

Meeting on preparation of a National Working Plan Code-Committee set up by the Government of India, Dehradun, August 18-19, 1999. The Principal Chief Conservator of Forests, Andhra Pradesh, chaired the meeting. V.B. Sawarkar represented WII as its nominee. The framework of the proposed National Code was discussed and finalized, including the inventory requirement and use of modern cartographic tools and GIS. It was decided that V.B. Sawarkar would draft the chapters on assessment, management and monitoring of wildlife and biodiversity elements.

2nd Annual International Conference on GIS, GPS and Remote Sensing, New Delhi, August 24-26, 1999. V.B. Mathur participated in the conference on GIS, GPS and Remote Sensing organized by Centre for Spatial Database Management and Solutions (CSDMS), and presented a joint paper with Yogesh Dubey on "Development of a Spatial Database for Natural Resource Assessment and Management in Tadoba-Andhari Tiger Reserve, Maharashtra".

Conference on "Ecology and management of ungulates: integrating across spatial scales", Nelson, British Columbia, August 24-28, 1999. A.J.T. Johnsingh presented a paper on "Conservation prospects for wild ungulates in Rajaji-Corbett Tiger Conservation Unit". After the conference, participants went on a field trip and observed the spawning of land-locked sockeye salmon (*Oncorhynchus nerka*), and visited the spawning site of Gerrard trout, the habitats of grizzly bear (*Ursus arctos*) and mountain caribou (*Rangifer tarandus caribou*).

Meeting on managing sal borer infestation in Rajaji N.P., other sal areas in U.P. and H.P., ICFRE, Dehradun, September 9, 1999. Being a member of the Steering Committee on

Sal borer constituted by the Government of India, V.B. Sawarkar represented the WII at this meeting. The Director General ICFRE chaired the meeting. Senior officers from U.P. and H.P. were present in this meeting. V.B. Sawarkar presented the paper on role of the sal borer in the sal forest community and the management perspective for both PAs and the managed forests. It was decided that only trap tree operations may be conducted in PAs where the infestation was in epidemic proportions with due approval from the government. The existing strategies in the managed forests as approved by the government in line with those in M.P. need to be followed. A monitoring committee was set up under the chairmanship of Director, FRI, with V.B. Sawarkar as one of its members.

The 12th International Conference on Bears, Brasov, Romania, October 13-18, 1999. This conference was organised by International Bear Association. S. Sathyakumar presented a paper on "Conservation Status and Management of Asiatic Black Bear and Himalayan Brown Bear in India" and N.P.S. Chauhan presented two papers viz., "Human-Sloth Bear conflicts in the state of Madhya Pradesh, India" and "Human-mauling behaviour of Sloth Bears in North Bilaspur Forest Division, M.P., India" - a poster co-authored with WII research scholars H.S. Bargali and N. Akhtar.

Regional Meeting on the Conservation of Marine Turtle, Perth, Australia, October 19-22, 1999. The Convention of Migratory Species (CMS) and the Environment Australia jointly conducted a follow-up meeting of Marine Turtle Scientists and Wildlife Fisheries Management officials from the Asian region in Perth, Australia to assess the current situation and status of marine turtles and their conservation management. The objective of the meeting was to analyze the management regimes of various Asian countries on marine turtles - *vis-a-vis* fisheries interface and to bring about a consensus of participating nations in developing a Regional Asian Sea-turtle management agreement. On the invitation of the CMS, B.C. Choudhury of Wildlife Institute of India participated in the meeting and appraised the participants on the status of marine turtles in the Indian Coastal

the Indian Coastal waters, breeding grounds and the fisheries interface problems. The presentation was based on the Wildlife Institute of India's work on sea-turtle along the Orissa coast and database of sea-turtle situation in other regions of the country.

International Technical Consultation on Protected Area Management and sustainable rural development-How can they be reconciled, Harare, Zimbabwe, October 26-29, 1999. FAO Rome invited Ruchi Badola to this consultation. She presented the background paper for the consultation and for the working group on collaborative management of PAs. The consultation aimed to review the problems that confront the PA managers particularly in developing countries and to identify the responses and approaches to such problems, which have been shown by experience to be effective. Sixty-three participants from 18 countries of Asia, Africa and Latin America and 6 international organisations took part in the technical consultation.

Field craft and monitoring course, Kumuly, October 30, 1999. V.B. Sawarkar attended the course for frontline staff conducted by the Wing of Kerala Forest Department at Kumuly.

Workshop on habitat management in Mundanthurai Tiger Reserve, November 2-6, 1999. The Wildlife Wing of the Tamil Nadu Forest Department, under its FREE Project conducted the workshop. V.B. Sawarkar, A.J.T. Johnsingh and Ravi Chellam represented WII. The team of researchers appointed by WII in the FREE Project also attended and made presentation on their work. The workshop took stock of the information generated by researchers; the management programs implemented by KMTR, especially the ecdevelopment initiatives and charted the future course of action. A.J.T. Johnsingh and R. Chellam had their inputs into wildlife surveys; research and interpretation of the results and V.B. Sawarkar dwelt on variety of management aspects.

Workshop on Wildlife Management Planning and Research for Officers of the U.P. Forest Department, Hotel Drona, Dehradun, November 18-20, 1999. V.B. Sawarkar made a presentation on the process and procedures of preparation of a wildlife management plan with examples drawn from PAs and managed forests of Uttar Pradesh. Ruchi Badola delivered a lecture on "Ecodevelopment- the concept and the emerging issues."

International Seminar on the Royal Bengal Tiger in the 21st Century, Calcutta, November 20, 1999. V.B. Sawarkar attended the International Seminar organised by the West Bengal Forest Department. He made a presentation on the 'Vision to the Future in Context of Tiger Conservation Strategies'. He reviewed the scientific and management initiatives over the last several years, the threats, weaknesses and opportunities and outlined the future requirements.

Workshop on Trade in Terrestrial and Freshwater and Turtles and Tortoises in Asia, Phnom Penh, Cambodia, December 1-4, 1999. B.C. Choudhury participated in the "Workshop on Trade in Terrestrial and Freshwater and Turtles and Tortoises in Asia" organized by the TRAFFIC-Asia and Wildlife Conservation Society. The workshop objective was to determine the current status of fresh water turtles and tortoises in the Asian region vis-a-vis their legal and illegal trade. The primary focus of attention in this meeting was to analyze the levels of illegal trade on turtles from the Asian region and its impact on the turtle fauna. B.C. Choudhury presented two papers titled "Current status of Indian Fresh water turtle and tortoises" and "Status of trade in Indian turtles and tortoises" based on the WII's earlier work on fresh water turtles and tortoises conducted during the year 1990 to 1994 under the WII-USFWS project.

Future Search Workshop on Zoological Parks, Hyderabad, December 3-5, 1999. The Central Zoo Authority organized the "Future Search Workshop on Management of Zoological Parks in India" at Hyderabad. Invited by the

CZA, B.C. Choudhury attended this workshop as a resource person and facilitator. He contributed in the workshop by joining various groups in analyzing the present scenario and assisting in creating a vision document. He was chosen by the CZA to be a member of the editorial team to produce the vision document.

First Annual South Asian Regional Environmental conference, Kathmandu, Nepal, December 4-7, 1999. Asha Rajvanshi was invited by the Regional Co-ordinator of South Asian Regional Environmental Assessment Programme of IUCN, Asia, to contribute as a resource person. Asha Rajvanshi led the workshop session on "Integrating Biodiversity Concerns in EIA" and also presented a paper "Mitigation Planning for Biodiversity Impacts of Pipeline Projects: Indian Experience". As the country representative, she also presented the country report on EIA System in a technical session devoted to presentations by country representatives.

International Workshop on Conservation and Public Awareness of Otters, Taichung, Taiwan, December 9-12, 1999. The aim of this workshop was to promote otter conservation through creative public awareness programmes in Asia by joining local people. S.A. Hussain and Ruchi Badola attended this workshop and presented papers.

4th International Conference on Pulp and Paper, New Delhi, December 14-17, 1999. This conference was organised by Inpaper, New Delhi. Pranab Pal attended the conference. The objective of this conference was to acquaint the participants with ecofriendly relationship of handmade paper and conservation of forest resources.

Workshop on "Statistical and Environmental Policy: Possible Interaction", Calcutta, January 10-12, 2000. Organised by the Indian Statistical Institute and Boernouli Society for Mathematical statistics and Probability, this workshop was a unique one to bring environmental scientists and managers in to a

common platform, where, based on statistically significant findings discussions were generated. The idea was to influence the policy maker and planners to focus adequate importance to environmental issues that are increasingly being researched. B.C. Choudhury was invited to be a panelist to discuss on the common environmental problems faced by the country in the wetland environment sector.

Seminar on "Agenda for institutions of Dehradun in 21st century", Dehradun, January 23, 2000. U.K.Bhattacharya, Bitapi C.Sinha, Pranab Pal and M.S.Rana participated in this seminar organised by DAV College Dehradun at Doon Press Club. DAV College and UGC sponsored the seminar. U.K. Bhattacharya talked about the role of WII, its agenda and mission. Bitapi C.Sinha and Pranab Pal talked about the waste management initiatives taken in WII and the recycling & production of handmade paper. M.S.Rana spoke about inter library linkages in the Doon Valley. The seminar was organised with a view to plan for a clean and green Dehradun with the help of citizens and institutions of Dehradun.

Workshop on Mountain Protected Areas, Dhaka, Bangladesh, January 24-25, 2000. S.K. Mukherjee participated in the Workshop on Mountain Protected Areas at Dhaka, Bangladesh.

International Workshop on subtle issues in Coastal Zone Management, IIIRS, Dehradun, February 3-4, 2000. S.A.Hussain participated in this workshop. This workshop was jointly organised by the Indian Institute of Remote Sensing, Dehradun and International Institute for Aerospace Survey and Earth Sciences, Netherlands. The objective of this workshop was to provide hands on training to tackle subtle issues in coastal zone management.

Sixth Meeting of the Governing Body of Biodiversity Conservation Society, Great Himalayan National Park, Kullu (Himachal Pradesh) Shimla, February 5, 2000. P.K. Mathur represented Director, WII in this

meeting under the chairmanship of Honourable Forest Minister, Government of Himachal Pradesh. He provided inputs relevant to research and monitoring activities undertaken in the Great Himalayan National Park Conservation Area by WII under the IDA funded Forestry Research Education and Extension Project during 1995-2000. The Honourable Minister released the final research and monitoring report prepared by WII in six volumes on this occasion.

International Conference on Biodiversity and Environment, Dehradun, February 8-9, 2000. V.B. Mathur participated in the International Conference on Biodiversity and Environment organized by the Indian Institute of Remote Sensing, Dehradun and presented a paper on "Remote Sensing and GIS Applications in Wildlife Conservation".

Meeting of Committee to identify parameters for designating ecologically sensitive areas in the country, New Delhi, February 22-23, 2000. The MoEF, GOI had constituted a high level Committee to identify parameters for designating ecologically sensitive areas in the country. S.K. Mukherjee, Director was one of the members of this Committee. The Institute was asked to submit write-ups on grassland, wetland and wildlife corridors. P.K. Mathur represented WII in the meeting held at the Planning Commission, New Delhi wherein the draft document was discussed and finalized.

Workshop on communities and conservation planning, IGNFA, Dehradun, March 11-12, 2000. This workshop was organised by the Rajaji National Park authorities. It was meant for the Senior and Middle level forest officers of the UP Forest Department. S.K.Srivastava delivered a lecture on "Communities and Wildlife Protection Act" during the workshop with various legal implications and ramifications. Ruchi Badola delivered a lecture on "Concepts of communities and their role in conservation."

Workshop on "Adverse impacts assessment upon tiger and elephant habitat due to open-cast mining operation in Bihar" New Delhi, March 15, 2000. Sushant Chowdhury attended this workshop as a resource person, which was organised by World Bank and Chem Project Consulting (P) Ltd. Impacts of unmanaged iron ore tailing on water quality resulting in habitat avoidance by large herbivores especially the elephants were highlighted due to increased TSS and turbidity. A greater concern was expressed on the stressing of ecosystem and biological communities due to heavy metal inputs in Singhbhum forests of Bihar.

Meeting and field trip of the Monitoring Committee for Sal borer in U.P., Dehradun, March 15, 2000. V.B. Sawarkar as a member of the Monitoring Committee attended the meeting and then undertook a field trip to the affected areas in Rajaji National Park and Dehradun forest division. Assessment procedures and monitoring protocols were reviewed. In view of the further spread of the epidemic, especially in Dehradun division, continuing the trap tree operations as per standards laid down was recommended. This



Infestation of borer (*Hoploceranobyx spinicornis*) on sal trees in Kanha Tiger Reserve.

included the Rajaji National Park as per the decision of the government. Further recommendations addressed establishment of semi-permanent plots to monitor trends; recording assessments prior to and post trap tree operations in appropriate season; felling of category 1&2 to be completed in Dehradun division by May 2000. Trap trees to be marked in the entire area by May 2000.

Training and demonstration on making handmade paper, Vishakapatnam, March 19-31, 2000. Pranab Pal attended this training and demonstration on making of handmade paper from the waste paper and agrowaste as a resource person.

Regional Consultation on Community Management of Natural Resources in South Asia, New Delhi, March 21, 2000. Ruchi Badola and S.K.Mukherjee attended this consultation and presented a paper and contributed in the discussions for increasing the effectiveness of community management of natural resources in South Asia.

World Conservation Union (IUCN) Regional Conservation Forum New Delhi, March 21-25, 2000. Ministry of Environment & Forests and WII jointly organised this forum. The major objective of this forum was to develop conservation strategy for Asia for the next millennium. S.K.Mukherjee, B.C.Choudhury and V.B. Mathur participated in the IUCN Regional Conservation Forum. V.B.Mathur made a presentation on "Biogeography and Conservation Planning in India". S.A.Hussain, Yashveer Bhatnagar and Praveen Singh acted as the members of the rapporteur panel alongwith eight other rapporteurs from IIFM, Bhopal, CEE Ahmedabad, G.B.Pant Institute of Himalayan Environment & Development and Wildlife Institute of India. The report was submitted to chief rapporteur Dr. Ainun Nishat, IUCN Bangladesh for editing.

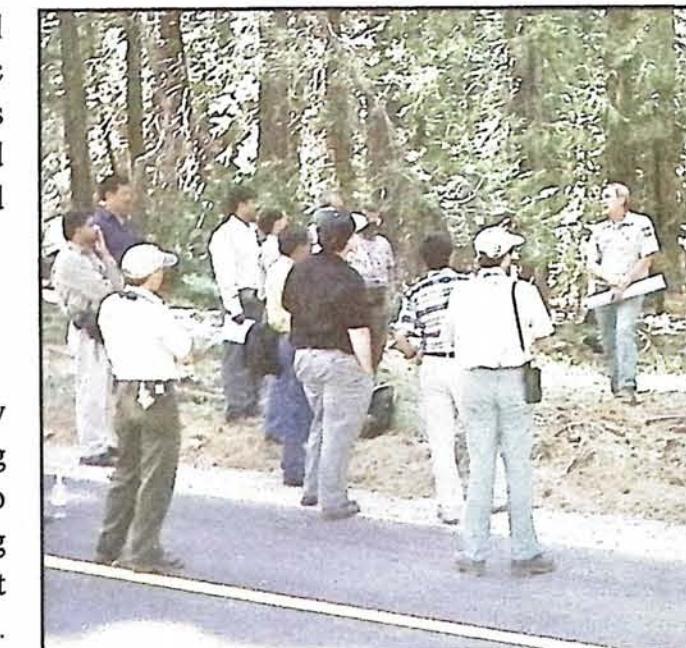
A 3-day National Symposium on "Conservation, Management and Sustainable Development of Fresh water Resources of India", Bhagalpur March 25-26, 2000. R.K. Singh attended a 3-day National Symposium organized by Freshwater Biological Association and PG department of Zoology and Botany, TNB College, Bhagalpur at Department of Botany, TNB College Bhagalpur. He presented a paper on "Managing riverine ecosystem for wildlife: An assessment for the need of desiltation of Chambal river". Singh also delivered a guest lecture on "Impact on unregulated iron-tailing on water quality and riverine habitat use pattern by elephants and other mammals in Singhbhum forests, Bihar" during the symposium.

Laboratory workshop on "DNA Profiling of Forensic Specimen using Short Tandem Repeat (STR) markers" Calcutta, March 27-April 7, 2000. S.P. Goyal and S.P. Rajkumar participated in this Laboratory Workshop held at the Central Forensic Science Laboratory (CFSL), Calcutta. Seventeen participants and three observers attended this workshop. Prof. H. Sharat Chandra, Department of Microbiology & Cell Biology, Indian Institute of Science, Bangalore, inaugurated the workshop and emphasized fast growing interest of genetic engineering in all the sciences of science. The workshop was aimed to inform participants on basics of DNA techniques in Forensic Science, provide hands-on of these techniques to deal forensic cases and establish linkages. Besides, participants were also told regarding value of this tool in other studies such as population genetic mapping, genetic diversity, curing genetic diseases and conservation. During this laboratory workshop, exercises were planned to cover: (a) methods of DNA isolation from biological specimens received from the crime scene, (b) amplification and analysis of STR loci with special emphasis on (i) Y-chromosome STR markers and (ii)

hypervariable regions in mitochondrial (mDNA), (c) Random Amplified Polymorphic DNA (RAPD) techniques for species identifications. Hands-on training was provided on STR analysis of DNA by manual and Automated DNA sequences.

Courses, Trainings and Study Tours

- Ruchi Badola was awarded a fellowship by Regional Community Forestry Training Centre (RECOFTC), Bangkok to participate in the International training programme on Participatory Management of Protected Areas during May 3-21, 1999. The course had 27 participants from 11 countries. The objectives of the course were to develop an increased understanding and exchange on approaches, constraints and lessons in participatory management of the Protected Areas.
- Under the US Forest Service Programme S.K. Mukherjee, V.B. Sawarkar, P.K. Mathur, Ajai Saxena and Sugato Dutt from the Institute side and eight field managers visited USA on a study tour during July 24, -August 7, 1999. The group visited mainly two important regions—the Southern Appalachian region on the east coast and Sierra Nevada region in the State of California on the west coast. The counterpart US scientists also joined the visiting group during their field visits to different areas. In addition to the field visits to different demonstration areas, workshops were also organized at Asheville, NC and the Institute of Forest Genetics (IFG), Placerville, CA. The visiting group was familiarized with different approaches of integrated forest management using the concept of large landscape/conservation area. The greater emphasis was laid on different tools and methods for forest and wildlife inventories, habitat assessment, timber management, endangered species management, management of forest insects, wildlife-habitat relationships, fire, recreation and tourism management and ecological monitoring. The visiting delegation was able to interact with a large number of scientists and field practitioners. The members of the visiting delegation also made presentations based on their field/research works at respective Indian sites.
- B. K. Mishra attended a SIDA sponsored advance international training on 'Sustainable Agriculture in an Environmental Perspective', at Svalov Weibull, Sweden during September 6-October 22, 1999. This training covered inputs pertaining to sustainable development planning.
- Pranab Pal attended the International Training Program on Handmade paper making conducted by the Fiber Industry Development Authority (FIDA) from September 20-October 3, 1999 at the Fiber Processing and Utilization Laboratory, Quezon City, Philippines.



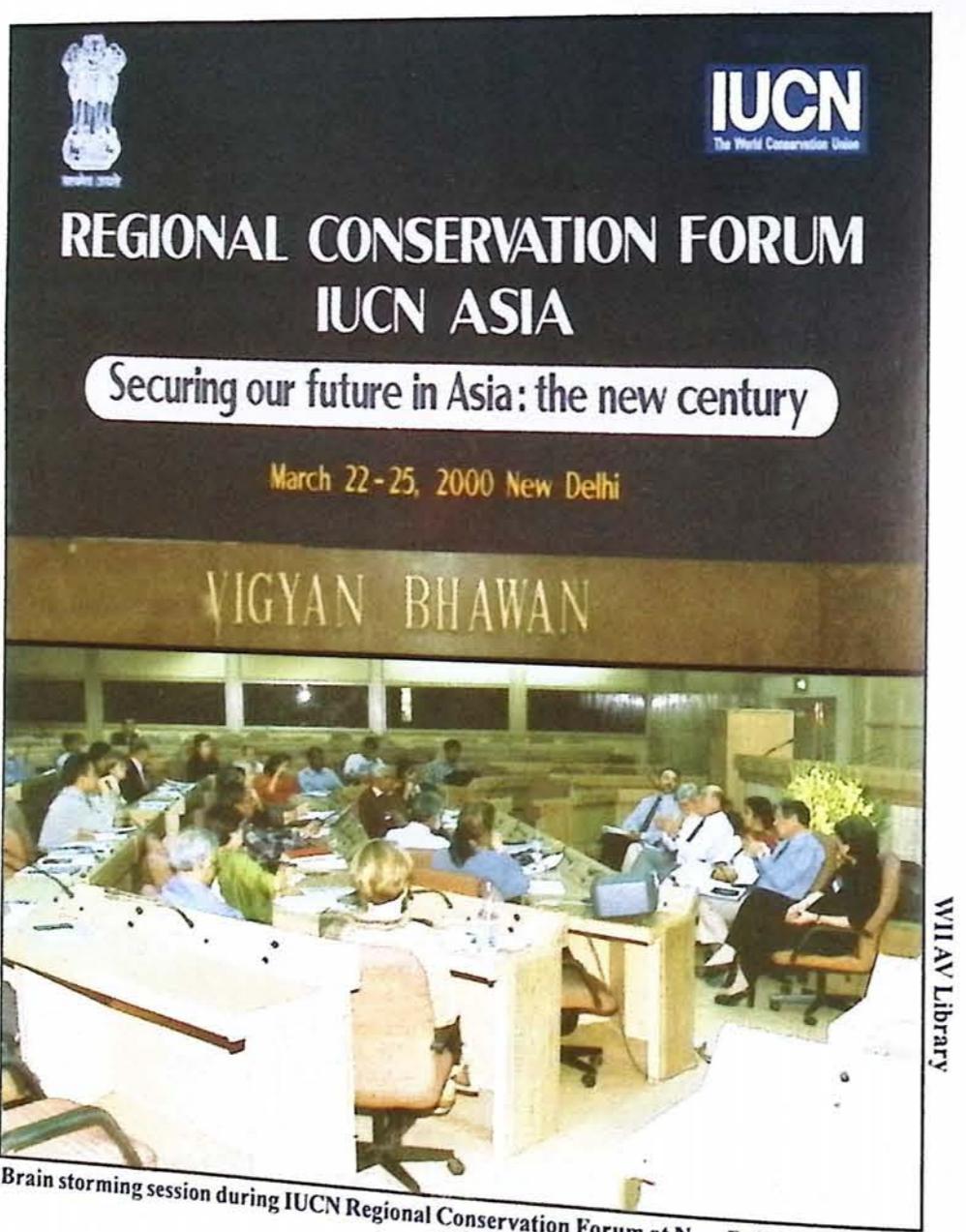
P.K. Mathur

Indian delegation interacting with USFS officials during visit to Eldorado National Forest, USA.

- Pranab Pal attended and completed international training course in "Biodiversity Conservation" held at the School of Environmental Science and Management, University of Philippines, Los Banos and participated in capacity development in Environmental Impact Assessment (EIA) at Cebu, Philippines during October 4-20, 1999.
- A.K.Gupta attended one week compulsory training course on "Human Resource Development" at Management Development Institute, Gurgaon during February 21-25, 2000.

Research

The Institute conducted 3 regular courses, 6 short courses, 6 workshops, 5 meetings and an Annual Research Seminar during the year 1999-2000. Over 500 participants and resource persons participated in these workshops, seminar and courses. Besides this, the Institute's faculty members also participated in a large number of workshops, seminars, conferences and meetings organised by other organisations.



COMPLETED PROJECTS

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

Investigator : B.C. Choudhury
Researcher : Bivash Pandav

Objectives of the project were to: (i) study the distribution of Olive Ridley sea turtle population along Orissa coast, (ii) enumerate the Olive Ridley nesting populations at Devi and Rushikulya rookery and to study the population dynamics of Olive Ridley at the three rookeries with greater emphasis given on Devi and Rushikulya rookery along Orissa coast, (iii)



Bivash Pandav

An Olive Ridley turtle being measured in the coastal waters off Gahirmatha.

make regular annual survey of sea turtle nesting beaches along Orissa coast and in the off-shore waters in order to monitor sea turtle nesting activities and to find out their extent of dispersal in the off-shore waters during mating and nesting season, (iv) monitor incidental catch of sea turtles by offshore fishing operations and finding ways and means of reducing this mortality, (v) To study the impact of fish landing centres near important sea turtle nesting beaches along Orissa coast, (vi) develop an effective eco-friendly management policy for the proper management

of sea turtle population and their nesting habitats along the Orissa coast.

The project was of four years and ten months duration. Field work for the project was initiated in December, 1994.

As part of this research program, sea turtle nesting beaches along Orissa coast were monitored from 1995 to 1999. Following are the major achievements of the project. (i) During the project duration 13,600 Olive Ridleys including 1,657 male Olive Ridleys were double tagged in the coastal waters of Gahirmatha rookery as well as in five nesting beaches in Orissa. (ii) Seventeen of the tagged individuals have so far been recaptured from coastal waters

of Sri Lanka (n=14) and south Tamil Nadu (n=3) indicating migration of Olive Ridleys to and from Orissa coast. (iii) Both male and female Olive Ridleys have been recorded to re-migrate annually to breed and nest in Orissa. (iv) Capture locations of Olive Ridley mating pairs recorded during the study revealed that the turtles occur in certain reproductive patches in the coastal waters and locating

such patches are essential to provide adequate protection to the turtle population visiting Orissa coast. (v) In total 46,219 dead adult Olive Ridleys were counted over six breeding seasons (1994 to 1999) along a stretch of 360 km off the Orissa coast. Near shore mechanized trawling activities have been identified as a major cause of this high sea turtle mortality in Orissa.

Fieldwork for the project got over in June 1999. The final report of this project is under preparation.

* Conservation genetic of Olive Ridleys (*Lepidochelys olivacea*) on the East Coast of India

Investigator : B.C. Choudhury
Researcher : Kartik Shanker

Project duration was from February 1999 – September 1999. The objective of the project was to study the population genetics of Olive Ridley sea turtles on the east coast of India with a view to their conservation. In recent times, molecular genetic tools have played a major role in answering questions of biological and ecological interest in marine turtles. Population genetic structure of Olive Ridleys on the East Coast with a view to evolving conservation strategies for these turtles was studied. Three sites in Orissa and one site in Tamil Nadu were sampled during February – April 1999. Various techniques - RAPD, multilocus fingerprinting, Microsatellite analysis, and Mitochondrial DNA sequencing were used to analyse DNA polymorphism at the Centre for Cellular and Molecular Biology, Hyderabad from June – October, 1999. The multilocus fingerprinting showed a high degree of polymorphism between individuals. The RAPD and Microsatellite analyses do not point to any population structuring along the coast. Low population structure points to weak natal homing in Olive Ridleys on the East Coast of India. Mitochondrial DNA sequencing revealed the presence of five haplotypes, two previously reported from Sri Lanka and three new haplotypes, which could be specific to Orissa. The dominant haplotype is the most ancient lineage in Ridleys, suggesting that Olive Ridley population on the East Coast of India could be the source for contemporary global populations of Ridleys. This increases the conservation importance of this population. This study has raised more important questions, which can be addressed using molecular genetic techniques.

* Impact assessment of tourism in Corbett National Park

Investigator : Bitapi C. Sinha
Researcher : Kaustubh Moghe

Close to 50,000 visitors come to the Corbett National Park annually with a sizeable chunk

comprising of foreigners. This has necessitated appropriate long term planning for tourism. A study was initiated in 1996 to assess the Impact of Toursim in Corbett National Park. The broad objectives of the study were: (i) To gather information about the present status of tourism and its management in the reserve, (ii) To identify and quantify the impacts of tourism on the habitat and wildlife, (iii) To provide management recommendations for planning conservation compatible and sustainable tourism within the reserve.

Impacts can result from the activities of visitors and from the construction and operation of tourist facilities and services. Impacts arising from tourism are difficult to assess, partly because of their diversity in range and in type. The major difficulties faced during the study for assessment of tourism impacts is:

- tourism involves a number of linked activities, making it difficult to distinguish impacts arising from individual activities;
- environmental change occurs naturally, making tourism – induced change more difficult to quantify. Thus the role of humans and nature cannot always be disaggregated;
- a lack of baseline data with which to compare post – development conditions and
- some impacts only become apparent in the long term.

Analysis of Pb (lead) concentration on grass and leaves of tree species close to the road and used by elephants was conducted. It is reported that the naturally occurring concentration of Pb in plant sample is 0.05-3 ppm. But analysis of samples collected and analysed from Corbett shows higher concentration of lead except in one species *E. musa*.

In the absence of any baseline or background information it is difficult to conclude but a geochemical mapping of the area would provide the background level of Pb in the habitat.

During tourism season approximately 13-15 kg non-biodegradable garbage is generated per week at the camping site at Dhikala and 7-8 kg per week at Bijrani. In the absence of any waste disposal system there was greater reliance on treating the waste inside the PA by burning in the cement tanks. After the presentation of facts during the Annual Research Seminar in 1999 the practice of burning of non-biodegradable material has been stopped by the park authorities and the garbage is collected and transported out of the park to Ramnagar. Park management in 1994 had introduced "Carry your Litter Back System" in which a plastic bag was put on sale at the Dhangarhi gate and visitors were encouraged to carry this bag and bring the litter back. During the study it was observed that the visitors who brought their garbage back either dumped it in the garbage bin at the Dhangarhi gate or dumped it across the road in the adjoining forest. The garbage collected in the bin too was either burnt or disposed off in the adjoining forest across. This fact too was brought to the notice of the park authorities through the study. Thus in 1999 a new scheme was launched to deal with this problem. It was made mandatory for the visitors to carry a plastic litter basket, by depositing Rs. 52 (Rs. 50/- as deposit which is refundable and Rs. 2/- cleaning charges).

In Corbett, visitors practice non-consumptive activity. Wildlife viewing is only limited to either by elephant ride or by vehicle on designated routes accompanied by guides. The study revealed avoidance and habituation amongst the animals. It was observed that a distance of less than 50m does cause a change in the activity of the animals and they move away from the source of disturbance. However, it is difficult to measure and quantify effects of disturbance to wildlife through tourism as the effects are not always obvious. The long-term effects of these subtle effects would need to be studied and monitored.

A large number of respondents interviewed during the study complained about the cleanliness and the maintenance of the accommodation and the facilities compared to the tariff charged for it. The improvement of

the infrastructure in the park depends on the availability of funds. One of the major challenges for wildlife tourism is how to ensure that PAs are financially self sufficient without detracting from their primary function of preserving biodiversity. To achieve this, it is essential to plough back the revenues. In the year 1998-99 the revenue generated from tourism in Corbett was Rs. 85.25 lakhs, which is 55% of the plan budget and non-plan state sector. Final report is under preparation.

ONGOING PROJECTS

- * **Project on "Developing a Scientific Model Management Plan for a Marine Protected Area (M.G. Marine National Park, Wandoor, Andamans) and draft Guidelines for Coastal and Marine Protected Area Management"**

Principal Investigators : Ajai Saxena and B.C. Choudhury

Researcher : Sarang Kulkarni

The institute initiated a scientific study during 1997 on inventorying and assessing the off-shore resources of the Mahatama Gandhi Marine National Park at Wandoor, Andaman & Nicobar Islands. The objective of the study was to document the coral biodiversity of the GMNP and the factors that impact the ecological processes and species diversity. Based on an assessment of the biodiversity richness and levels of impact, to develop management action plan that will ensure the conservation of the off-shore coral reefs. During the first year of the project, the project focused its attention on mapping the terrestrial system resources and study the socio-economics and tourism related impacts. Work was also initiated to sample coral reef systems to document reef structures and coral status.

During the current report the project emphasized its attention to consolidate its studies on coral reef, coral community study and developing proper resource maps based on GIS domain. The study resulted in documenting several new species of coral for the Indian region

and at least five new species of coral for the Indo-Malayan region. Impact of uncontrolled tourism, sedimentation loads and El-Nino effect was also documented. The project intends to complete its work during the next six months and based on a discussion workshop where our findings can be presented and a consensus based management plan recommendations will be developed.

- * **Impact of land use changes on habitat and ecology of Sarus Crane (*Grus antigone*) in India**

Investigator : B. C. Choudhury

Researchers : Jatinder Kaur and K. S. Gopi Sundar

The objectives of the project are to : (i) study the ecology and behaviour of Indian Sarus Crane in natural and human-altered habitat to determine the critical biological requirement of the species. (ii) to determine changes in the land-use patterns over the years, with reference to the ecological distribution of Sarus Crane in India, and to identify significant negative and positive impacts of changes in land-use pattern, on the ecology and behaviour of the species. (iii) to suggest strategies for the long-term survival of Sarus Crane in its present range of distribution.

Studies on the ecology of the Sarus Cranes were initiated in Etawah-Mainpuri districts of U.P. and Kota and Bharatpur districts of Rajasthan since December 1999 and February 2000 respectively. Three components of Sarus Crane biology are being studied viz. feeding biology, breeding requirements and behavioural ecology.

For feeding biology, droppings are being collected, sun-dried and stored for analysis. Microhistological slides are being prepared of all plants found in each of the areas to determine the diet of the cranes. In Etawah, the cranes were seen to depend on paddy in September-October and fallen grain from October-December. Wheat was a major component in the droppings during March-May. Sarus were seen to feed abundantly on crops such as potato, green gram, horse gram and peas. The principal invertebrate groups in the diet are coleopterans, embiopterans, odonata, and molluscs. Few vertebrates are eaten and the cranes were observed feeding on amphibians and small snakes. Seasonal differences in composition of diet are being analysed.

Breeding biology of cranes nesting in agriculture fields, natural wetlands and canal-induced wetlands are being studied in the two states. Sarus were seen to prefer natural wetlands over all other types of habitats for nesting. Of 12 nests observed in Kota, and 54 nests monitored in Etawah for the 2000 breeding season, majority of the eggs were seen to be lifted by people. Chicks are extremely vulnerable to attacks of feral and domestic dogs, and a very small success rate was seen. In Etawah, eight juveniles of the 1999 breeding season have been colour-banded with uniquely coloured plastic rings, and territory size of families is being determined. The surviving juveniles of the 2000 season will be colour banded in both areas to determine mortality, territory size and distance of dispersion from the parents. In Etawah, most of the nesting takes place between July-October, while a dual breeding cycle was observed in Rajasthan with cranes nesting in May-June and then again in July-October. The reasons for the dual breeding cycle will be determined after data is collected for another year.



Breeding cranes nesting in agriculture fields.

Activity budgets of Sarus Cranes were determined in both areas with data taken for both cranes using natural wetlands and cranes using agriculture fields. While the majority of the data is being analysed, preliminary analysis showed that cranes with young prefer wetlands for feeding while pairs without young prefer agriculture fields, especially during the pre-nesting period. There was a difference observed in activities of males and females in families with males being more alert compromising on the time spent to feed. In pairs without young, no difference in activity budgets of the sexes were seen. Human activity was determined to be the most disturbing factor for wild cranes.

Data for all three factors will be collected for the next year as well, before a thorough analysis is carried out and recommendations will be made to conserve free-ranging Sarus Cranes.

* **Ecology and Management of Problematic sloth bears (*Melursus ursinus*) in North Bilaspur Forest Division, Madhya Pradesh, India.**

Investigator : N.P.S. Chauhan
Researchers : Harendra Bargali and Naim Akhtar

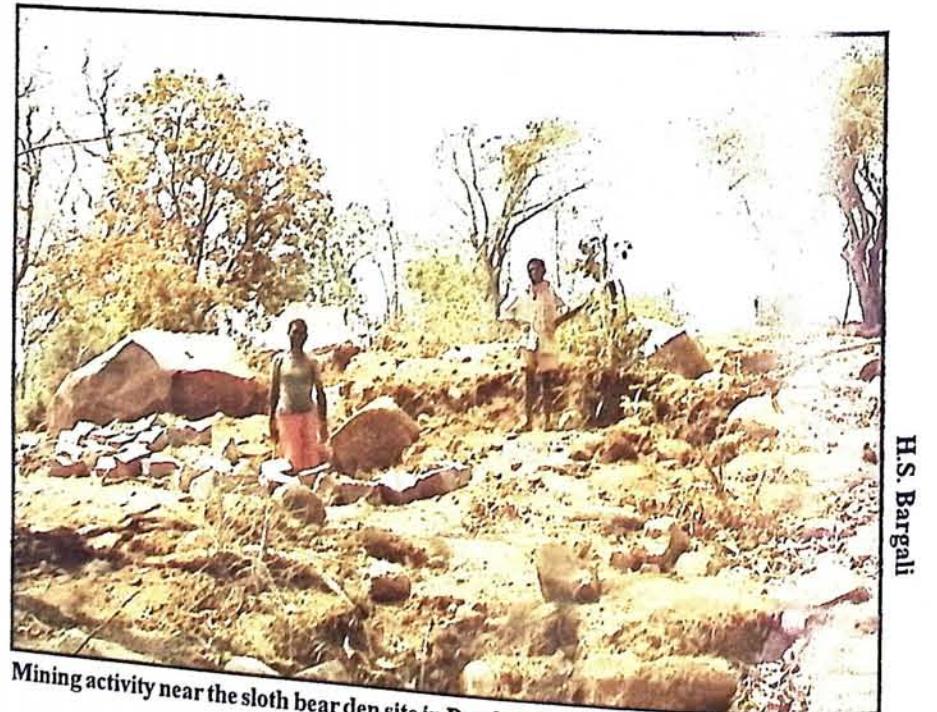
The project was initiated in April 1996. However, the researcher fell sick and left the project. Subsequently, two research fellows were appointed in February 1998 and the project was re-initiated. The project aims to study the ecology and management of problematic sloth bears in North Bilaspur forest division. The objectives of the project are: (i) to prepare habitat maps and quantify vegetation composition and structure within each habitat, assess the distribution and population density of sloth bear in the study area, (ii)

to quantify habitat use and ranging patterns of sloth bear using radio-telemetry, (iii) to assess seasonal changes in the sloth bears dietary intake, evaluate human-bear conflicts and formulate recommendations for mitigation of human-bear conflicts. The study will help in developing conservation and management plans for sloth bears in this region. The project duration is 3 year 9 months. In the study area, Pendra and Marwahi ranges, 89 fixed transects were laid in the entire area and information on vegetation composition and structure using remote sensing data and ecology of problematic sloth bears is being collected. Of the six sloth bears radio-collared in 1999, one radio-collared bear died. Now 4 bears are being continuously monitored to study their activity and ranging patterns.

* **Pheasant Survey in Arunachal Pradesh with emphasis on *Lophophorus genus***

Investigator : Pratap Singh
Researcher : R. Suresh Kumar

This study was undertaken in continuation of earlier two studies on pheasant distribution in Arunachal Pradesh, which resulted in discovery of a new pheasant taxon in the state of Arunachal Pradesh. The World Pheasant Association



Mining activity near the sloth bear den site in Pendra, North Bilaspur Forest Division.

funded this project. The project's fieldwork began in September 1999. Useful information on distributional range of new *Lophophorus taxon* and also on other pheasants was obtained during the survey. Work is in progress to ascertain taxonomic status of the new taxon.

* **An Ecological Study of Sympatric Hornbills and Fruiting Patterns in a Tropical Forests in Arunachal Pradesh**

Investigator : G.S. Rawat and Pratap Singh

Researcher : Aparajita Datta

This study was initiated in February 1997 with the following major objectives: (i) to identify the patterns of annual fruit production and role of hornbills in the dispersal of various tree species in the tropical forests of Arunachal Pradesh, (ii) to compare the nesting biology of the four sympatric hornbills in the study area, (iii) to study distribution, and status of hornbills in Arunachal Pradesh. Total study period is four and half years.

Fieldwork in the Pakhui Wildlife Sanctuary to collect data on the nesting behaviour and regeneration pattern of food species was carried out during the reporting period. Data on the predation and loss of seeds to invertebrates and vertebrate seed predators were analyzed. Six food species of the wreathed hornbill (*Aceros undulatus*), the great hornbill (*Buceros bicornis*) and possibly of the Oriental pied hornbill (*Bucoceros albirostris*) belonging to *Moraceae*, *Meliaceae* and *Annonaceae* were selected. The adult densities of hornbill food plants varied from common or very high (> 30 trees per ha) to rare or very low (< 1 tree per ha). Hornbills regurgitated seeds of all these food plants. Germination experiments showed that seeds of all regurgitated species remain viable and in a few cases showed enhanced germination success and rate. It was found that seeds of the rarer species were subjected to greater damage due to both rodent gnawing and insect infestation whereas rodents did not attack the commonest species at all. There was also an

inverse relationship between measured levels of seed predation and the adult densities of the plant species. The pattern of seed deposition by hornbills during the breeding season was highly clumped with seed rain concentrated under the nest trees. This concentration of seeds under nest trees to an extent mimics the situation of seed rain under parent trees where establishment is hampered by density-dependent mortality and greater levels of seed predation.

Besides post-dispersal seed predation, the life-history characteristics of species and the frugivore assemblage feeding on these species may also contribute to differing density. During April–May 1999, the researcher visited Mahidol University Thailand to take a field course on the ecology of Hornbills. The Jawahar Lal Nehru Memorial Fund sponsored this visit.

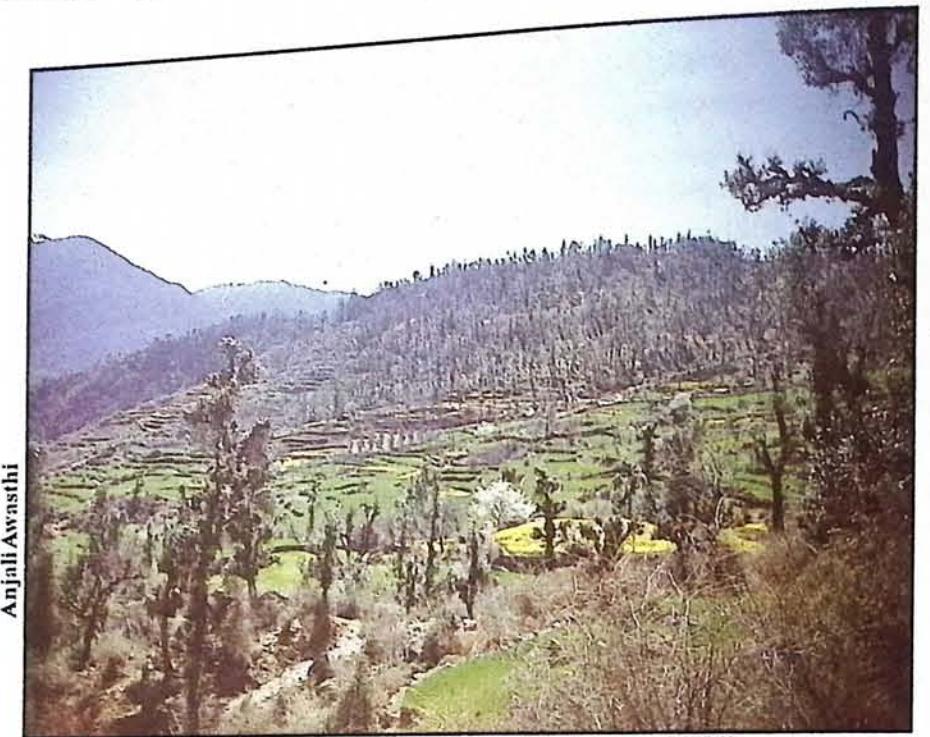
* **A Study on the Conservation Status of High Altitude Forests in Garhwal Himalaya with Special Reference to Landuse Practices and Tourism**

Investigator : G. S. Rawat, Asha Rajvanshi and B.S. Adhikari
Researchers : Sanjay K. Uniyal and Anjali Awasthi

This project primarily aims at assessing the conservation status of high altitude forests in Bhagirathi valley. The specific objectives of the project were : (i) to study the structure and composition of forests along the gradients of altitude and anthropogenic pressures; (ii) to prepare the vegetation map of the study area; (iii) to quantify the resource use pattern of the local villagers and other trans-human communities on the forests, and (iv) to assess the overall conservation status of high altitude forests. The study was initiated in December 1996 for a period of 5 years.

The study was carried out in two phases viz., (i) the survey of vegetation structure and production potential in the Tehri Dam submersible zone, (ii) study of the structure and composition of higher altitude forests in the Bhagirathi Valley.

The report of phase has been submitted. During the reporting period data were collected on the



Anjali Awasthi

Degraded high altitude forests in the vicinity of villages in Bhagirathi Valley.

structure, composition and standing biomass of woody vegetation along the altitudinal and human use gradient. Current levels of pressure in the (intensive study area) were also assessed. Patterns of fuel wood and fodder extraction by the migratory as well as settled villagers were assessed. The study revealed that there was a spatio-temporal variation in the resource extraction. The standing biomass of preferred woody species at low altitude villages and summer settlements (chhans) were 140.68 ± 26.91 trees/ha and 477.46 ± 31.8 trees/ha respectively. Average fuel wood consumption per household at permanent villages was 14.65 ± 0.78 kg/day whereas consumption per chhan at temporary settlements was 36.42 ± 3.35 kg/day. There was a limited choice of fuel wood and fodder species at higher altitude. Higher per capita consumption of fuel wood per chhan located near timberline suggests that current practice of migration to high altitudes may not be sustainable in the long run. This might result in decline of the relatively undisturbed forest at middle elevation which has comparatively higher available above ground biomass (377.73 trees/ha) and regeneration capacity (241.36 no of seedlings & saplings/ha).

Fieldwork in both the study areas has been completed. Analysis of data collected from the second site is in progress. The researchers were deputed to Indian Institute of Remote Sensing, Dehra Dun for three months for a basic training on Photogrammetry and Remote Sensing (RS) applications. This training would be useful for interpretation of RS data, preparation of vegetation and landuse maps and do time series analysis for land cover changes.

* **Ecology of gaur (*Bos gaurus*) in Pench Tiger Reserve, Madhya Pradesh**

Investigators : K.Sankar and Qamar Qureshi
Researchers : Mohd. Khalid Sayeed Pasha and G. Areendran

The objectives of the study were to collect information on density, distribution, population structure, feeding habits, habitat use, ranging pattern, social organisation and predation of gaur in Pench Tiger Reserve (PTR), M.P. The five-year research project was initiated in 1996. Using line transect and vehicle transect techniques, the density and distribution of gaur and other wild ungulates were studied in different habitat types. Three gaurs (2 males and 1 female) were radio-collared to study the ranging pattern and habitat use. Information on food habits of gaur has been collected by direct observation of individuals and by using micro-histological techniques.

Maps of PTR in 1:1,50,000 scale have been prepared using GIS domain. The annual home range of male and female gaur worked out to

be 200 sq km and 150 sq km respectively. The group size and composition of gaur varied between seasons. The mean group size of gaur during summer, monsoon and winter was 3.7 ± 0.14 , 5.9 ± 0.57 and 7.0 ± 0.37 respectively. The sex ratio of gaur also varied seasonally. The male: female ratio during summer, monsoon and winter was 73:100, 56:100 and 62:100 respectively. The ratio of calf: cow during summer, monsoon and winter was 28:100, 8:100 and 3:100 respectively. In all 77 species of food plants, comprising of trees, shrubs, climbers, herbs and grasses belonging to 24 families were recorded. Of these, family Leguminosae accounted for the highest number of individuals (18%) followed by Gramineae (15%). Gaur showed seasonal differences in use of areas in response to browse height (tree and shrub), shrub volume and grass and herb cover. The major predator of gaur in PTR is tiger (*Panthera tigris*) but leopard (*Panthera pardus*) is known to predate on calves and yearlings of gaur. Since the initiation of the study, only 7 kills of gaur were collected. Of these 3 were yearlings, 3 bulls and 1 cow. Leopard killed 1 yearling and tiger

predated the rest. The final report will be submitted in Dec. 2000.

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

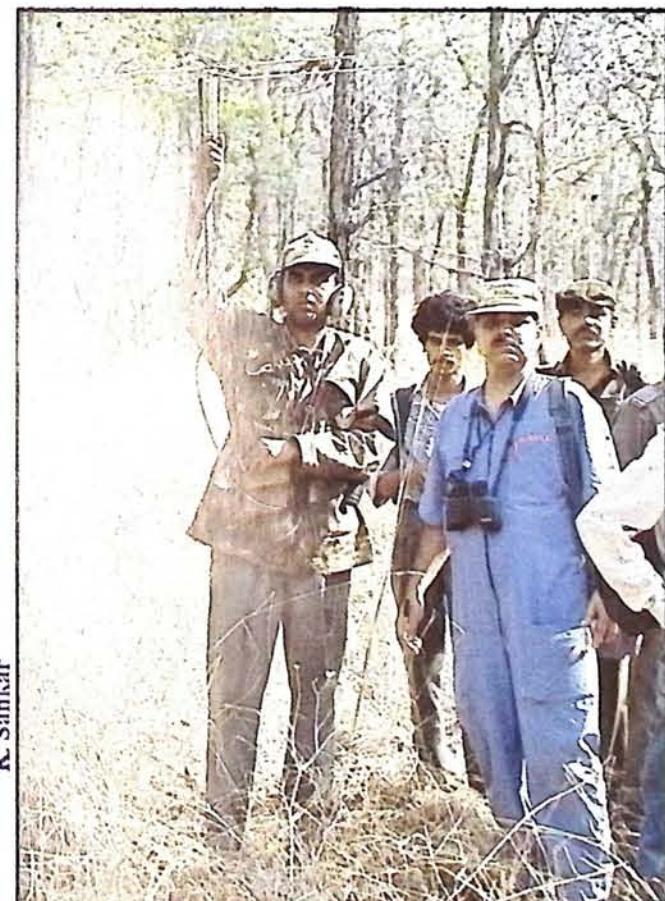
Investigators : R.S. Chundawat and A.J.T. Johnsingh
Researcher : Neel Gogate

The major objectives of the project were to : (i) evaluate habitat suitability for tiger and its prey species (ii) collect information on home ranges, land tenure patterns and social organization (iii) determination of food habits.

During the last four and half years a total of five tigers were radio-collared. M01 is being monitored since April 1996, Fm03 since March 1998 and Fm04 since January 1999.

The home range of M01 decreased from 184 sq km to 137 sq km in 1999 due to a territorial fight with his neighbouring male. However, his home range still covers ranges of 3 females. Fm03 is a daughter of Fm02. This female stayed in her natal territory for a couple of months after collaring and dispersed to establish her own territory in the beginning of monsoon in 1998. She has carved out her territory next to her mother's range in the Panna range of the Reserve. She occupies an area with high human disturbance. At times she also ventures into the forested areas outside the reserve which is heavily disturbed mainly due to cattle grazing and people. In March 1999 she mated with an unknown male and gave birth to her first litter of two cubs in the first week of June. Most of the kills made by Fm03 were of cattle, followed by nilgai.

Fm04 is a sibling of Fm03 and like her sister, she also stayed initially in her natal territory before shifting to establish her own territory adjoining her mother's range. In the process of establishing her area she has replaced an old



K. Sankar
 Three gaurs were radio collared in Pench TR to study the ranging pattern and habitat use.



Neel Gogate

Water is one of the limiting factors for tigers as most of the streams of the Panna National Park dries up by January.

resident female. She occupies one of the best areas of the reserve with high prey biomass and low biotic pressures. She mated with M01 in the last week of June 1999 and gave birth to her first litter of two cubs at the end of November 1999. She mainly preyed on nilgai and cattle. Though the radio-collar of Fm02 has stopped functioning, but the information of her location data are still being received through sightings. At present she is raising her third litter of 3 cubs. She has been occupying one of the best areas of the park, which is reflected, in her diet dominated by sambar.

Habitat map of Panna Tiger Reserve was prepared using remotely sensed data. Similarly maps showing different ungulate densities were also prepared. The results showed that tiger distribution is closely associated with high sambar and chital density areas. Though, nilgai contributes more to the prey biomass, areas with high nilgai density were not selected by tigers.

Major findings of the project are large home ranges compared to the tigers inhabiting optimal habitats and therefore, sparse tiger density. Tigers are extremely mobile in nature due to high disturbance factor and water is the overriding factor for the area.

EXTERNALLY FUNDED RESEARCH PROJECTS

US-Fish and Wildlife Service-Phase II

* **Identifying potential areas for conserving biodiversity in the Indian Himalayas**

Investigators : V.B.Mathur, R.S. Chundawat, Qamar Qureshi, Don Hunter and Rodney Jackson

Researchers : Rashid H. Raza, Meera A.Ommen, R.Jayapal and C. Kala

Major research objectives of the project were: (i) to build a biodiversity model from targeted surveys of vegetation and mammals conducted in two existing national parks; (ii) to apply the biodiversity model to protected and unprotected areas representing the two major biogeographic zones in the Indian Himalayas; and (iii) to write a biodiversity action plan for the Indian Himalaya based on an effective biodiversity model for both biogeographic zones. The Himalayas harbour a rich diversity of floral and faunal species and are considered as a 'hotspot' of the Indian sub-continent. Although past conservation efforts have seen establishment of many protected areas, the

network is still regarded as inadequate and there is a widespread concern that protected area coverage may not be representative of the biodiversity spectrum of the Himalayas. This project was launched in 1995-96 with a goal to assess the adequacy of the protected area network in the Indian Himalayas in providing adequate coverage to the rich biodiversity and to identify potential areas for conservation.

The project has sought to develop techniques based on Remote Sensing (RS) and GIS techniques combined with field surveys to identify areas of high conservation importance. In a two pronged strategy, patterns of distribution of biodiversity at regional as well as local scales are being studied. This would help in assessing the adequacy of protected area coverage in relation to distribution of biodiversity at both these scales. Socioeconomic concerns are also being integrated in the assessment of potential areas for conservation.

The project has mainly targeted plants, birds and large mammals in this study. Secondary databases for distribution of plants and birds in the western Himalayas are nearly complete. Preliminary analyses of these databases suggests that highest species diversity both for birds and

coverage for characterizing the abiotic template is in an advanced stage of preparation.

Fieldwork in Kedarnath WLS for developing surrogates of birds and plant diversity will be completed by June 2000. Preliminary analyses of data suggests that diversity patterns of plants and birds differ, with highest plant diversity occurring in the lowest altitude (1700 - 2000m) zone while the bird diversity peaks in Upper Temperate (2700m) zone in Kedarnath. The patterns at local and regional scales may differ due to regional patterns incorporating the geographical turnover of species as well. However, bird communities seem to be strongly related with vegetation communities. Techniques combining topographic information from spatial data layers and satellite imagery for modeling vegetation distribution and improving vegetation classification are being developed.

A brief survey of vegetation and birds was conducted in Ladakh during September 1999 to develop relationship of bird and plant communities within landscape units.

Considering the importance of the unique biodiversity of the Ladakh region, the paucity of basic ecological information of this area and the difficult field conditions, WII and its collaborators on the present project, the International Snow Leopard Trust and US Fish & Wildlife Service decided to initiate a long-term research programme in Ladakh to fill this information gap. A Field Research Station (FRS) was established in October 1999 at Leh under the Collaborative Ladakh Research Programme. Ecological studies on 8 research components and 2 training courses/ workshops will be conducted in the year 2000. The research work includes gathering baseline information on

vegetation, medicinal plants and its traditional use, insects, herpetofauna, birds, mammals, wetlands and human-wildlife conflicts.



Rashid H. Raza
Kedarnath Wildlife Sanctuary was selected as an intensive study area for surrogates of birds and plant diversity.

plants occurs in the middle altitude zone (1500-2000m) and not in the lowest altitude as has been traditionally assumed. The spatial database

* **Evaluating Panna National Park with special reference to the Ecology of Sloth Bear**

Investigators : A.J.T. Johnsingh and Dr. Clifford G. Rice (Washington State Department of Fish and Wildlife, Olympia, WA, USA)

Researcher : K. Yoganand

The objective of the project was to study the activity, ranging behaviour of the sloth bear and the effects of human disturbance on bear behaviour. The project was initiated in October 1995. Fieldwork continued for the fourth year, by tagging, tracking sloth bears and proceeding with other associated habitat studies. Three new sloth bears (two adult females and an adult male) were fitted with radio collars, raising the total number of animals radio-collared during the study to twelve (six males and six females). It was evaluated if sloth bear scats or digging signs counted along fixed routes could be used as an index to monitor population trends. The seasonal, diet-dependent and yearly variability of the index were assessed. It appears that the scat encounter rates reasonably reflect population sizes.

A nationwide questionnaire survey was conducted to assess the distribution, status and threats to the sloth bear and its habitat. Information has been received from over 250 areas (protected and non-protected) spread across the country. The Western Ghats and Central Indian forests are the two strongholds of present distribution. Dry and moist deciduous forests together hold the major proportion of sloth bear population (about 90%) and sloth bear occurs at higher densities in the moist deciduous forests as compared to other forest types. Using the

abundance ranking information provided by the respondents and by calibrating the abundance ranks based on density estimates. The data was extrapolated proportionately to potential sloth bear habitat and arrived at a minimum and maximum estimate of 9,860 and 15,480 sloth bears in India. Maps were generated portraying various aspects, using the information provided by the respondents. Fieldwork in the project continuing.

* **The relationships among large herbivores, habitat and humans in Rajaji-Corbett National Parks**

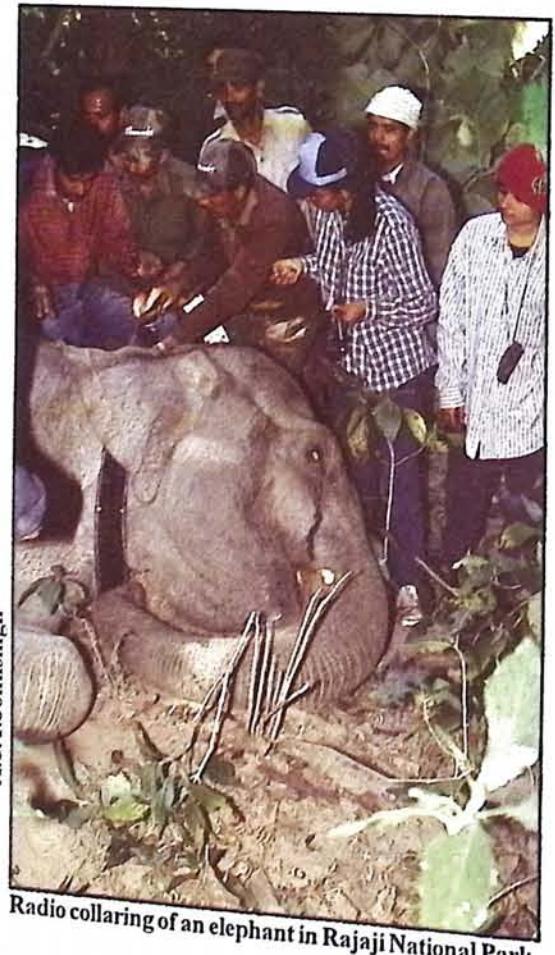
Investigators : A.J.T. Johnsingh, S.P. Goyal, G.S. Rawat, Asha Rajvanshi and Paul Krausman

Researchers : A. Christy Williams, Aparajita Hajra, Joy Dasgupta and Anil Kr. Singh

Objectives of the project are: (i) to determine the distribution patterns of the elephant population, to estimate their densities, quantification of habitat use using radio telemetry and determine nutritional composition of diets, (ii) to prepare the habitat maps and

quantify the vegetation structure and composition within each habitat, (iii) to assess the resource use patterns of the resident pastoral Gujjar population and the biotic pressures exerted by the resident and adjacent village communities, (iv) to know the distribution pattern of ungulate species and estimate their relative abundance.

Duration of the project is five years and it was initiated in October 1995. The project aimed to gather information on habitat, vegetation, people, elephant use and ungulate distribution. This would enable to identify



A.J.T. Johnsingh

Radio collaring of an elephant in Rajaji National Park

crucial conservation areas in Rajaji-Corbett National Parks to ensure the long-term conservation of elephant, tiger and prey species.

The researcher entrusted with the elephant component of the project went on a study visit to the University of Arizona, U.S.A to analyze and write up the report under the guidance of the U.S collaborator. The report will deal with the problems that need to be solved to ensure the survival of elephants in northwest India. Enroute, from June 28-July 2, 1999, he visited Hungary to make a presentation at an International conference on wildlife in Godollo on the use of 'Mark re-sight method of wild elephant population estimation' a technique used for the first time in Asia.

The vegetation component of the project deals with the analysis of wildlife habitat and vegetation studies. The vegetation map of the entire project area (from river Yamuna to Kosi) has been prepared. Also a detailed vegetation map on the intensive study site (the Rajaji-Corbett corridor) has been prepared. The digital elevation model (DEM) for the entire project area has been prepared at 1:250,000 scale at a contour interval of 100 m, which will be further processed to prepare slope and aspect maps. Quantification of vegetation structure and composition in the intensive study site has been completed and data collected has been analyzed for community structures. Eight community types have been delineated on the basis of TWS viz. Eucalyptus plantation, Dalbergia plantation, Acacia plantation, Tectona plantation, Shorea forest, dry mixed deciduous forest, moist mixed deciduous forest and a small patch of Pinus forest. The regeneration patterns, availability of herb and shrub cover are presently being analyzed within each community type.

Mapping of individual Gujjar deras located in the Rajaji National Park and the Rajaji-Corbett Corridor and the estimation of population of the Gujjar Community and their livestock was completed. A representative number of Gujjar deras were identified for intensive studies to assess their resource use patterns. A trail mapping exercise of the boundary of Rajaji NP has been already completed and the village level dependency is currently being assessed.

Rajaji NP was stratified based on terrain and grids (2x2km) were overlaid for finding temporal distribution of ungulate species. Data were collected in randomly selected 33 % grids. Results of three methods of estimating relative abundance i.e. direct count, track count and pellet count was compared in order to come out with a simple way of monitoring fluctuation in ungulate abundance. A detailed technical report on the above aspects has been submitted.

* **Development of an Indian Wildlife Health Cooperative (IWHC) programme**

Investigators : Pradeep K. Malik and F. Josh Dein

Duration of the IWHC Project is five years (1995-2000). The main goals of the project were: (i) advance the capabilities of select Veterinary Colleges to provide diagnosis and investigation of disease outbreaks, control and prevention, information exchange, education and consultation to wildlife managers, biologist and veterinarians; (ii) develop a standard wildlife health curriculum in all Veterinary Colleges; (iii) develop a field guide on wildlife diseases for wildlife managers and biologists; (iv) enhance the capabilities of faculty members at five regional centers and the Indian Veterinary Research Institute enabling them to teach a course in wildlife health at undergraduate level and supervise graduate student programmes. They would have also developed expertise to conduct training courses and workshops on wildlife health monitoring for wildlife managers and biologists; and (v) increase co-ordination of Wildlife Health Programmes in India through the establishment of an Indian Wildlife Health Cooperative (IWHC).

The fifth year of the project began with mid-term evaluation of the project by Dr. John Cooper and Prof. (Dr.) V. Gnanaprakasam. The evaluators concluded that the project is strongly committed to the cause of wildlife health. The faculty members and administrators at all five regional centres, Guwahati, Hissar, Madras, Anand and Jabalpur have shown great personal commitment.

Some of the major achievements of the five centres are (i) IWHC, Guwahati: TB Testing in captive elephants; Preventive health management of captive elephants in 7 protected areas of Assam. (ii) IWHC, Madras: Electrocardiography in captive elephant; National Training Programme on Wildlife Health and Investigation Techniques. (iii) IWHC, Jabalpur: Investigation of protozoan diseases in captive elephants in Kanha National Park; Development of Wildlife Health Curriculum for frontline staff of M.P. Forest Department. (iv) IWHC, Hissar: Workshop on Health Management of wild and captive animals for the wildlife, Haryana; Workshop on Biological Sampling for disease investigation at Keoladeo National Park, Bharatpur; Investigation of tiger mortality in Ranthambore National Park. (v) IWHC, Anand: Investigation and control of Ranikhet disease in aviary of Junagadh Zoo; Diagnosis and treatment of 52 species of wild animals and birds admitted to IWHC, Anand from various zoos in Gujarat.

All the IWHC Centres were provided Wildlife Immobilization & Restraint equipment and also training in anesthesia of wildlife.

* Establishment of Wildlife Forensic Capacity at Wildlife Institute of India

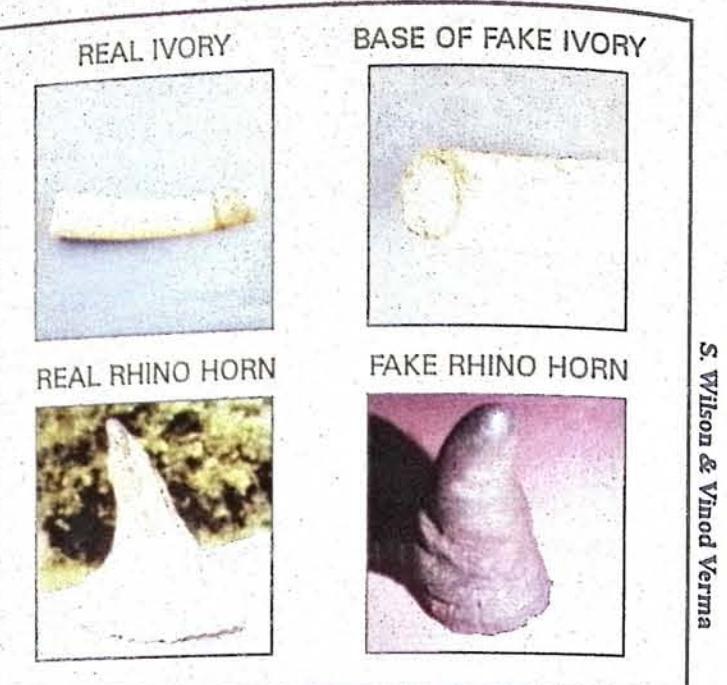
Investigators : S.K. Mukherjee, S.P. Goyal

Co-investigator : K. Sankar

Researchers : Archana Bahuguna and S.P. Rajkumar

The objectives of the project were as follows: (i) to prepare a Perspective Plan for the development of wildlife forensic technology in India; (ii) to establish linkage with national and international institutions of repute in the wildlife forensic technology; (iii) to create required infrastructure; (iv) to become proficient in species specific identification of Indian vertebrates using morphological characteristics; (v) begin accumulating and storing tissue samples for the eventual use in biochemical analysis; (vi) to disseminate the acquired knowledge to users.

Duration of the project is five years and it was initiated in October 1995. The project is aimed



In an attempt to find out the kind and extent of illegal trade techniques have been developed to identify the real and the fake specimen.

to come out with a (i) Perspective Plan at the National level for developing Wildlife Forensics, (ii) manuals for identifying species from parts and products and (iii) techniques suitable for preserving tissue samples collected in the remotest area of forests. It was attempted to find out the kind and extent of illegal trade and poaching in order to develop techniques by sending 256 letters to forest officials of 17 states. Efforts were concentrated for identifying species based on hair using Light and Scan Electro Microscopy of 97 species belonging to families *Bovidae*, *Cervidae*, *Tragulidae*, *Suidae*, *Equidae*, *Felidae*, *Canidae*, *Procyonidae*, *Ursidae*, *Herpestidae*, *Viverridae*, *Mustelidae*, *Elephantidae* and species of the other order such as *Chiroptera*, *Rodentia*, *Lagomorpha*, *Insectivora* and *Primates*. Keratin proteins from many sources were extracted and SDS-PAGE (Sodium Dodecyl Sulphate-Polyacrylamide Gel Electrophoresis) of keratin protein was done. A simple protocol was developed for preservation of tissue samples and the technique was standardized for further use in identification of species. In establishing repository of tissue samples at the Institute, in all 23 species of mammals, 23 species of birds, 4 species of reptiles from National Zoological Park, New Delhi have been received. Standardization of protein profiles of different species has been undertaken to identify species from the tissue samples.

Various parameters used for identifying species from hair are external features, medulla type,

statistical analysis of dimensions, cuticular type, cross section and scale index. Study revealed that each species has set of characteristics of hair unique to species. The differences were found in keratin polypeptides of tiger and leopard hair. Silica gel was found to be very effective preservative for identification of species from tissue samples. The effectiveness of this preservative was proved by using different techniques like Double diffusion, SDS-PAGE, Isoelectric focusing and by Phosphoglucomutase.

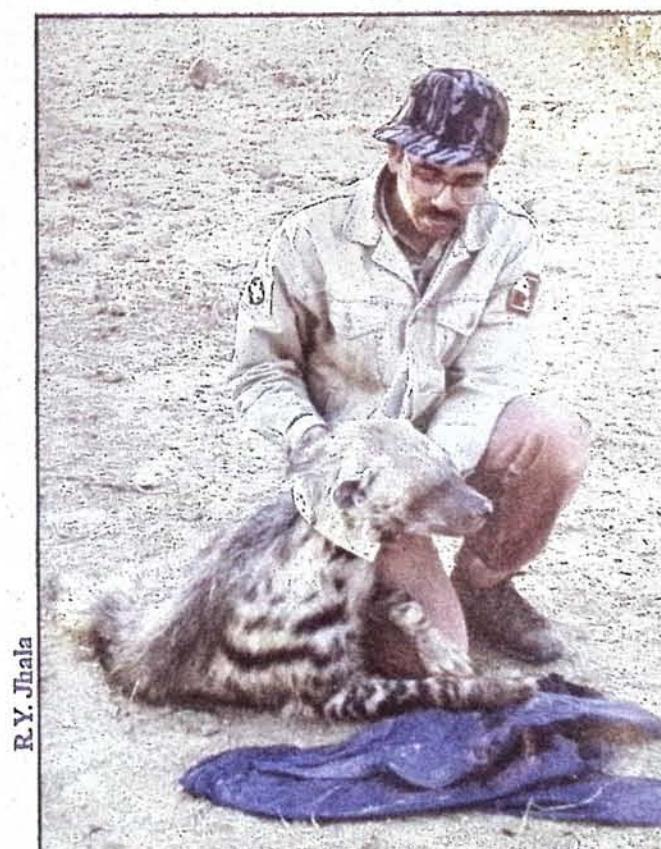
* Conservation of the Indian Wolf

Investigator : Y.V. Jhala

Researchers : Dinesh K. Sharma, Bharat Jethva and Priyadarshini K.V.R.

The U. S. Fish and Wildlife service funds for this research project were available from May 1996. The objective of this research project is to gain an understanding of the ecology of the endangered wolf, its prey species and other sympatric carnivores.

Substantial progress has been made in revising the distribution range of the wolf in India.



Radio collaring a striped hyena in Kutch to study their ecology and competition with wolves.

Intensive study using modern techniques of radio-telemetry are being carried out in three areas; the Bhal and Kutch areas in Gujarat and Ojar area in Maharashtra. These areas differ in terms of habitat, prey and socio-economic conditions and are representative of wolf habitats in western and central India. Detail investigation of the intense human-wolf conflict in eastern Uttar-Pradesh was made an ecological and socio-economic insight into this problem was gained. Key ecosystem processes, prey species (blackbuck and chinkara) population dynamics and other carnivores like the striped hyena, the golden jackal and the caracal are also being studied. This component was included in the study since studying a carnivore in isolation of its ecosystem would be of little use for its conservation. Hyenas and jackals are being studied with the assistance of radio-telemetry.

This is the first study on the ecology of hyenas in India and the preliminary data is very interesting. The study shows that hyenas live in colonies that are predominantly female are very social and these colonies have exclusive territories. Data on food habits, ranging patterns, habitat use, human conflicts, mortality factors, population parameters and behavior of wolves, hyena and jackals have been collected. This research project has received funding from US-India Fund allocations of the U.S. Fish and Wildlife Service, National Geographic Society, Center for Field Research (Earthwatch) and National Fish and Wildlife Foundation.

* Impact of fragmentation on the biological diversity of rainforest small mammals and herpetofauna of the Western Ghats Mountains, South India (Collaborative project between WII, USFWS and SACON)

Investigators : Ajith Kumar (SACON), Ravi Chellam and B.C. Choudhury; Barry Noon (Colorado State University)

Researchers : Karthikeyan Vasudevan, Divya Muddappa, N.M. Ishwar

The project commenced on October 1, 1995 and is scheduled to end on June 30, 2000. It has field bases in Kalakad-Mundanthurai Tiger Reserve (KMTR) and Indira Gandhi Wildlife Sanctuary (IGWLS). The rainforests of KMTR are treated

as contiguous site while the forest fragments are in and close to IGWLS.

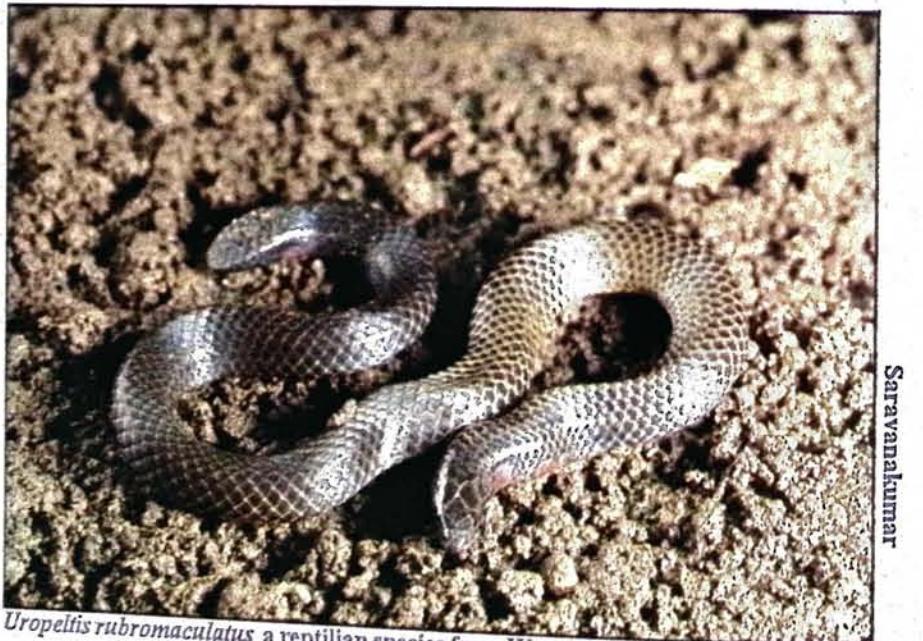
The major objectives of this project are: (i) to identify the major factors which govern the faunal distribution (herpetofauna and small mammals) and relative abundance in a large, contiguous and relatively undisturbed rainforest in Kalakad-Mundanthurai Tiger Reserve, (ii) to identify the extent and nature of changes brought about by forest fragmentation on the major factors identified above and relate these to changes in faunal distribution and abundance in the rainforest fragments of Anamalai hills, (iii) to develop a set of statistical models based on (i) & (ii) above, which would allow the prediction of faunal changes as a function of fragmentation, (iv) to carry out a survey across the Western Ghats to validate predictions of the models.

Much of the fieldwork of the project has been completed and currently data analysis and report writing is under progress. The models to predict the faunal changes as a result of forest fragmentation are currently being developed. The survey of forest fragments is likely to be restricted in its coverage to amphibians and reptiles. The survey will take place beyond the scheduled date of closure of the project. During 1999-2000 fieldwork was carried out in both the study sites. Sampling for reptiles was completed in the rainforest fragments identified for sampling in IGWLS, Anamalai Hills. Radio-

collared brown palm civets were tracked to obtain data on their home range size, ranging patterns, habitat use and activity patterns. Data on roost tree characteristics and phenology of food plants of civet were also collected. Fieldwork in KMTR was completed in December, 1999. From January 2000 a survey

for small carnivores in the rainforest fragments has been initiated. This phase of the fieldwork is scheduled to be completed by June 2000.

Forty species of reptiles were recorded from 14 rainforest fragments of which 21 species are endemic to the Western Ghats. The very large fragment, Akkamalai had the highest number of species (30) and also the highest number of endemic species (19). A decline in species richness as well as the occurrence of endemic species was recorded in fragments along a gradient of fragment size. The nested subset analysis shows that the reptile species distribution is highly nested. The most dominant taxon in these fragments was agamids followed by geckos and skinks. Forty species of amphibians were recorded from all fragments. Species richness in fragments increased as a function of its area. The distribution of amphibian species in the forest fragments was also nested. In total 7 brown palm civets were radio-tracked for periods ranging from less than



Uropeltis rubromaculatus a reptilian species from Western Ghats.

a month to 10 months. The home range size ranged from 3.6 ha to 57 ha (95% minimum convex polygon). All day bed sites of civets were located on trees. Giant squirrel nests and tree hollows were the most commonly used day bed sites. Brown palm civets were distinctly nocturnal in their activity regimes.

* **Planning and Development of Interpretive Facilities in Panna National Park and Corbett National Park**

Investigators : Ujjawal Bhattacharya, Bitapi C. Sinha, Rajeev Bhartari, Gary Stoltz and Gayle Hazelwood

The project was initiated in 1998 with the aim to provide comprehensive interpretive facilities using a variety of appropriate media in order to enrich visitor experience.

During the reporting year resource inventory and data collection were carried out for preparation of interpretive plan. While preparing inventory of the interpretive resources, delineation of areas of special interest was made and potential interpretive themes were identified. Text and designs of signages which will be weather tested have been prepared.

It was agreed upon by consensus that the site of the old PWD Guest House at Mandla would be the best choice for setting up of an Interpretation Center because of its location, proximity to the park and also the area available. In discussion with the Field Director a renovation plan has been prepared.

A one-week training programme for Park Guides was conducted in Panna National Park from October 4-8, 1999. Total of 27 participants was trained. The objective of this training program was to: (a) prepare a small group of local educated youths as guides for conducting Indian as well as foreign visitors in the national park and (b) promote wildlife tourism in Panna National Park by attracting visitors visiting Khajuraho.

In order to make the visitors aware of Panna National Park, a translite was designed, fabricated and installed at Khajuraho airport.

In order to acquaint the staff about interpretive facilities the core group of staff of the project was taken on a tour to Kanha National Park.

In Corbett, a MoU with the Uttar Pradesh State Forest Department was signed on October 26, 1999. There was an agreement that interpretive facilities are required to be provided in the Jim Corbett Museum at Kaladungi. Necessary modifications/changes in the civil structure, landscaping etc was suggested to be undertaken by the park management. Once the complete water proofing, anti-termite treatment as well as modification in the civil structure is carried out exhibit designing and installation will commence for the museum.

USDA Forest Service

* **Management of Forests in India for biological diversity and forest productivity – A New Perspective**

Investigators : V.B. Sawarkar, P.K. Mathur, Ajai Saxena, D.V.S. Khati, Sugato Dutt, Sanjay K. Srivastava (WII); Bruce Marcot, Richard Holthausen, John Lehmkuhl, Martin Raphael, Tom Darden (USDA) Forest Service, Dhananjay Mohan, IGNFA, P.C. Tyagi, FSI.

Researchers : Anjana Pant, Harish Kumar, Ashish Kumar, and T.K. Sajeev

The project was initiated in 1995. Objectives of the project are: (i) to assess, document and map as appropriate the kinds, extent and distribution of plant and animal diversity in selected forest sites through rapid survey methods, (ii) to use the existing status and habitat relationships information to set up baseline information, (iii) on a stand to landscape level perspective, evaluate the impact of existing variety of forestry practices, use of forest based resources by local people including the methods of harvests and collection, fires, operation of varied concessions and rights on micro habitat elements, key habitats, species, communities, the overall forest productivity and diversity, (iv) to rapidly assess the local village systems in terms of varied landuse, forest resource dependency including

raising and grazing of domestic livestock, other vocations, skills, economy and markets. These will be seen in relation to forest systems. Threats to ecological harmony and economic status of people will be documented, (v) to use modern ecological concepts in developing practical management tools and practices for bringing about harmony within and between forest and village systems through sustainable landuse practices which make ecological and economic sense. Document problems and threat mitigation prescriptions and develop site specific guides for management, (vi) to conduct workshops and seminars to share experience and disseminate knowledge.

The study sites are: (i) The Balphakram National Park (NP), Siju Wildlife Sanctuary (WLS) and outlying Reserve and Community forests in Meghalaya (GCA); (ii) The Dudhwa Tiger Reserve and forests of north and south Kheri divisions in U.P. (TCA); (iii) Satpura NP, Bori and Pachmarhi WLS, managed forests of Hoshangabad, north, west and south Betul forest divisions of M.P. besides the Melghat tiger reserve and managed forests of east, west and south Melghat divisions of Maharashtra (SCA); (iv) The Anamalai WLS and managed forests of Kodaikanal and Dindigul divisions of Tamil Nadu (ACA).

Landmarks: Biological and social impact assessments are in operation. For the first time, areas on landscape scale have thus been taken up for rapid assessments. The project framework is geared to demonstrate operational strategies for maintenance of biological diversity in the field that especially address the production forests and a new approach to establish wildlife habitat relationships are undertaken for the first time. Field level workshops and a national level workshop were conducted to demonstrate the working of the new perspective. Field staff was trained in the techniques and methodology for data collection under the rapid assessment system. Contribution to development of chapters and section on conservation of biological diversity and

wildlife in the proposed National Code for Forest Working Plans initiated by the Government of India. Data collection in all sites continued.

GCA: Twelve (12) new transects added to the previous 16, and data for 25 transects from different categories of primary and secondary forests as well as from different land use categories were analysed. GIS based technique was used to create a spatial database on forest vegetation types, their extent and landuse categories from IRS-ID satellite imagery.

ACA: Transects were laid in stratified vegetation communities which included six natural and four plantation communities based on distinctive succession stages. On these open width transects, point counts for birds and their habitat were made. Vegetation sampling was done on variable size circular plots at every 50-metre interval. Twenty metre radius for trees, 5 metre for shrubs, 2 metre for seedlings/saplings and one metre for grasses and herbs. Dung and pellet groups for elephant, gaur, sambar, chital, barking deer were counted in the 5-meter radius plots. Except for data on point counts for birds the other data sets were analyzed using a variety of statistical packages.

TCA: For landscape characterization and mapping IRS 1B LISS II satellite data was used. Vegetation/landuse map was prepared by using ARC/INFO. Areas of different vegetation/landuse categories, number of patches, patch size and shape was established. For vegetation assessment in the managed forests 168 nested plots were laid on transects at 200 m interval, 20 m x 20 m for trees, 10m x 10 m for shrubs, 1m x 1m for grasses and herbs. The tree and shrub species richness was described by Menhinick's index. Pearson correlation coefficient was calculated and using PCC values cluster analysis was accomplished.

SCA: Data on community attributes were collected by establishing 220 additional plots to the 80 assessed last year. All were in managed

forests – North Betul 185, South Betul 50 and West Betul 165. Different silvicultural treatments constituted the strata. Assessment of the impact of NTFP collection strategies adopted by people on six species continued viz. *Buchanania lanza*, *Diospyros melanoxylon*, *Terminalia belerica*, *T. chebula*, *Madhuca indica*, *Emblica officinalis*. Fruit production per tree, seed banks and regeneration status were assessed. Forest change detection was taken up for assessment. Change in the extent of forest cover between 1975 and 1985 was attempted using maps of FSI. The software ARC/INFO and ARCVIEW were being used in the GIS domain.

Forestry Research Education and Extension Programme [FREEP]

* **Ecological Studies on Kalakad-Mundanthurai Tiger Reserve: An Ecodevelopment Approach**

Investigators : S.K. Mukherjee, S. Dutt, A.J.T. Johnsingh, G.S. Rawat, B.K. Mishra, and N.P.S. Chauhan

Researchers : J. Ray, J. Ronald, H. Joshi and S. Gupta

This 3-year project was initiated in December 1996. The World Bank under the Government of India's Forestry Research, Education and Extension Project (FREEP) funded this project.



Pitcher plant (*Nepenthes khasiana*), Baghmara Reserve Forest, Meghalaya

The major objectives were to prepare the floral and faunal inventory of the KMTR, quantify the people's pressure on the biological and other resources of the park with a view to evolve an ecodevelopment strategy. Other components of the study include: documenting history of past management in the area, ecology of selected rare and endemic species, ethnobotany of the local people, assessing effectiveness of the on-going ecodevelopment activities, economic valuation of the

natural resources within the reserve, and study on the human-wildlife conflicts. The baseline information on above aspects was collected to create a database in the domain of Geographical Information System (GIS) in collaboration with the French Institute, Pondicherry for further analysis and monitoring.

The project was completed on December 31, 1999. The study revealed that KMTR harbors ca. 1156 species of Angiosperms (998 Dicots and 158 Monocots). About 423 of these species are endemic to the Western Ghats and 95 (of 423) are found exclusively in KMTR. Status of rare endemic species along with suggestions for *in-situ* and *ex-situ* conservation measures has been given. Detailed ethnobotanical surveys were conducted within Kani settlements that have resulted in documentation of 212 species of medicinal plant alongwith their traditional uses. Findings on the

faunal studies include an update on the avifauna (251 species), information on the abundance and habitat use by large mammals, distribution and conservation status of small mammals, especially slender loris (*Loris tardigradus*). The Ecodevelopment initiatives taken by the KMTR Management were assessed. It has also facilitated some trust between the forest department and the local people unlike in other PAs. Based on the overview of ecological and socioeconomic research, recommendations have been given for the long term conservation and holistic management of the Greater KMTR and Agasthyamalai ranges (following the principles of eco-regional planning) with a strong note on continued research and monitoring.

* **Biological and Socio-economic Monitoring in Kalakad-Mundanthurai Tiger Reserve - Development of monitoring protocols for conservation of biodiversity**

Investigators : Sanjay K. Srivastava, A.J.T. Johnsingh, G.S. Rawat, B.C. Choudhury, B.K. Mishra and K. Sankar.

Researchers : Jayanti Ray, J. Ronald, Santam Gupta, S.P. Vijaya Kumar and Ashok Raghavendran.

The overall objective of the project was to develop monitoring protocols so as to assess the various social and ecological impacts of the project activities in the tiger reserve. As part of the collaborative project with the French Institute, Pondicherry, a detailed database in the GIS domain has been developed with baseline information on topography, terrain, drainage pattern, vegetation and distribution of various species of flora and fauna. The 3-month study was carried out from January to March 2000 and it gave an idea of the critical impacts of management activities *vis-a-vis* ecodevelopment activities in KMTR. The monitoring protocols developed on vegetation and wildlife habitat, mammal and herpetofauna abundance have a direct bearing on the ecological impact assessment whereas socio-economic monitoring

envisages the effect of ecodevelopment activities on the local population in the ecodevelopment zone.

* **An Ecological Study for the Conservation of the Biodiversity and Biotic Pressures in the Great Himalayan National Park Conservation Area-An Ecodevelopment Approach**

Investigators : B.M.S. Rathore, P.K. Mathur, V.B. Mathur, G.S. Rawat, A.K. Bhardwaj, N.P.S. Chauhan and S. Sathyakumar.

Consultants : H.S. Pabla, A.S. Negi, Sarnam Singh, Vinay Tandon, Sanjeeva Pandey, Virinder Sharma, S.K. Dutta, D.K. Upreti, J.M. Julka, Amita Baviskar, Sudesh Nangia, Camille Richard, Anthony J. Gaston, Maureen A. DeCoursey, Peter J. Garson and Richard Tucker

Researchers : V.P. Uniyal, Pardeep Kumar, Suneet Naithani, Vinod T.R., Sanjay K. Singh and K. Ramesh.

A 5-year major research and monitoring project funded by IDA was launched in the Great Himalayan National Park Conservation Area (GHNPCA) in April, 1995 and was completed in March, 2000.

The project aimed to assess biodiversity, socio-economic conditions and forest dependency of local communities, identification of critical habitats, ecologically sensitive species and their habitat needs and biotic pressure on the PAs. In addition, the project also aimed to design and develop a Long Term Ecological Monitoring (LTEM) frame work and to impart relevant training to the frontline staff. The GHNPCA covers an area of 1,171 sq km and includes three protected areas (PAs) viz., the Great Himalayan National Park, Tirthan Wildlife Sanctuary and Sainj Wildlife Sanctuary. The project involved a multi-disciplinary team based at the project field site at Banjar, Kullu. On successful completion of the project the final report

including 30 different technical reports in 6 volumes, was submitted to the Project Tiger, Government of India.

The project has provided significant baseline information on the floral and faunal diversity, land use, historical developments, socio-economic conditions of local communities and people's attitude and perceptions. Different studies have so far identified and documented (1,174 plant species belonging to Angiosperms, Gymnosperms, Pteridophytes, Bryophytes and Lichens and 377 faunal species). The project also contributed valuable biological and ecological information on some of the rare and endangered faunal species viz., Musk deer, Himalayan tahr, Himalayan black bear, Blue sheep, Asiatic brown bear, Western tragopan, Kalij pheasant and Himalayan monal. Ecological studies on these rare and endangered species provided information on their distribution status, biology and major threats faced by them. Intensive studies on the forest resource dependency including livestock grazing and eco-tourism were also carried out. Tasks reports on these specific themes provided a comprehensive assessment and management recommendations. Fifty-seven species of plants and animals were short-listed by the multi-disciplinary research team for inclusion in the LTEM programme. The research team conducted a large number of field site training workshops for the frontline staff and other stakeholders. Thus the capacity

building of the field staff was an important agenda of the project. The project has ultimately contributed valuable baseline information on the GHNPCA and provided a spatial and temporal database for the park management. An effort is currently on to bring the electronic version of the report through Internet for its wider use by the scientific community as well as field practitioners.

Funded by Ford Foundation

* **Building Partnerships for Biodiversity Conservation in Rajaji National Park**

Investigators : B.M.S. Rathore, A.K. Bhardwaj and Ruchi Badola

Objectives of the project are: (i) Capacity enhancement of Park Management for Biodiversity Conservation with people's involvement (ii) Capacity Enhancement of identified park dependent local communities so as to minimise people and park conflict (iii) Facilitate co-ordination among key stakeholders to resolve conflicts that have implications for biodiversity conservation.

Quite a few Protected Areas are facing severe conflicts between the local communities and the park management. Rajaji NP is one such PA where the situation has been very tense for the last 10 years. This project is trying to bring

together different stakeholder on one platform so that creating mutual trust can ensure enabling environment for biodiversity conservation through problem solving. The project is also trying to enhance the capacities of the local staff and the communities so as to enable them to deal with complex situations like this and to ensure that both the Protected Area and the local communities are benefited on a long-term basis. Other important outputs of the project are preparation of micro-



The final report (I-VI Volumes) of the research & monitoring component of FREE-GHNP Project.

Vinod Verma

plans for identified villages and village clusters, information generation through short-term research and process documentation. WII's role is as a facilitator to evolve an institutionalised mechanism for the improved park management through involvement of the local communities and other stakeholders of the area. The project duration is from June 1996 to June 2001. The main landmarks of the project were the capacity building of staff and creation of a spearhead team of the staff for taking up the role of in-house training, baseline data generation through short-term research, and institution building through microplanning.

During this reporting year, the focus was on Institution building through microplanning and trust building activities. Ecodevelopment committees for 6 villages representing 6 cluster areas could be constituted after a prolonged consultation process. In two of the villages, trust-building activities have been carried out which have led to the drafting of microplans for these villages. The ongoing process of capacity building was continued by spearhead team of the park with the support of WII faculty involved in the project.

Funded by Institute of Terrestrial Ecology, U.K.

* The ecology of the Asiatic wild dog or dhole (*Cuon alpinus*) in Central India

*Investigators : A.J.T.Johnsingh (WII) and Dr. Leon Durbin (Institute of Terrestrial Ecology, U.K.)
Researcher : Bhaskar Acharya*

The Asiatic wild dog or dhole (*Cuon alpinus*), like its African counterpart, is a highly social carnivore - hunting and breeding cooperatively throughout its range. In the past it occurred from southern Russia to India, through Indo-China to Indonesia. The Dhole Project was initiated in June 1998 as a 3-year collaborative study of the dhole in the Kanha Tiger Reserve, Central India.

The main objectives of the project are to determine the food and habitat requirements of the dhole, its relationships with its prey species, other sympatric carnivores and domestic animals, the relationships between pack members, and the genetic diversity within the population. The reasons for the wide population fluctuations in central Indian populations of the dhole are a prime concern of this project. Data are recorded on the diet of the dholes, composition of prey animals, hunting success rates ranging behaviour and social organisation. Aspects of dhole genetics and disease screening are being looked into. A questionnaire survey has also been set in motion to gather more information on dhole's distribution and status. Armed with this knowledge, it would help to make recommendations and prioritize conservation action to ensure future of dhole.

PROJECTS INITIATED

* A study on distribution, relative abundance and food habits of leopard (*Panthera pardus*) in Garhwal Himalaya

*Investigator : S.P.Goyal
Researcher : Devender Chauhan*

The aims of the proposed study on leopard in Garhwal Himalayas are (i) to study current status, distribution and relative abundance in relation to habitat characteristics (terrain and vegetation). (ii) to study food habits in relation to prey (wild and domestic) availability. (iii) to prepare long-term research project to study behavior and ecology of leopard in order to suggest measures to reduce man-leopard conflict.

Duration of the project is one year. It was initiated in December 1999 and the report is based on 4 months of fieldwork. One of the tasks of the current project is to assess the extent of Leopard -Man conflict and plan a long-term

study to ascertain reasons for changed behaviour of animals in hills.

It is planned to survey 9 blocks (Pauri, Kot Khirsu, Pabau, Kalgikhel, Thalisean, Ekeshwar, Nanidanda and Pokhra) in Pauri division and 6 blocks (Dhugadda, Yamkeshwar, Jahrikhal, Bironkhal, Dwarikhal and Rikhnikhal) in Lansdown division of Pauri Garhwal district. A questionnaire was used to assess the problem and work is in progress. In all 193 scat and 43 pugmark tracings were collected. During survey, five sightings of leopard were recorded from different areas. Vegetation survey alongwith leopard survey was also done and all kinds of habitat based on remote sensing data were assessed. Villagers, forest officials, hunters and social workers were contacted and an assessment of the leopard problems in the hills was made.

All the places where incidents have happened were visited and an assessment of the circumstances of leopard attacks was made. The leopard's victims data have been taken from forest department record.

It seems that not one particular area is suffering from the problem but villages of some blocks are worst affected viz. Pauri, Pabau, Dhugadda, Dwarikhal, Jahrikhal and Kalgikhel. Around Pauri, leopards have killed six human beings within six month. Villagers opined that the systematic cutting of pine trees in areas near to Pauri (Kandoliya hills) to build residential quarters on large scale has resulted in decline of habitat quality and prey species. With such large scale felling, most of the areas are now under thickets and providing good cover to leopards. Weeds such as Lantana, Xanthium, and Eupatorium are dominating around villages. Due to human pressure mainly illegal hunting, cattle grazing, deforestation and habitat alteration, prey species are either locally extinct or their numbers are too small to sustain the existing numbers of leopards. These could be reasons for leopards becoming man-eaters.

A preliminary data analysis reveals that victims were mostly children and women. It seems leopards are always looking for soft preys.

In past, local people used to kill leopards through which the population may have been kept under control. But after implementation of Indian Wildlife (Protection) Act (1972), killing by general public is almost negligible. It is speculated that there may probably be an increase in leopard population. The forest department is now caught in difficult situation between saving the lives of the people and those of leopards. Whenever an incident happened, forest department authorized hunters to remove the man-eater from that area. Thirty-five (35) leopards have been killed as man-eater in past 11 years.

Project funded by the Central Zoo Authority

* Preparation and maintenance of stud books for five endangered species

*Investigators : Ravi Chellam and B.C. Choudhury
Researcher : Anupama Koliyal*

The objective of this project is to compile and update stud books for Indian Tiger, Asiatic lion, Golden Langur, Lion Tailed Macaque and Greater One-Horned Rhinoceros populations held in captivity in India. This project commenced on October 1, 1999 and is scheduled to end on June 30, 2000.

Data is being collected, based on a questionnaire survey and by visits to zoos which have either held these species or are currently holding them as a part of their collection. Progress of this project has been rather slow initially due to slow responses to the questionnaire survey. The researcher is scheduled to visit many of the zoos to collect data. The studbooks for greater One-horned rhinoceros, Golden langur and Lion-tailed macaque are likely to be completed before those for Indian tiger and Asiatic lion.

* An Evaluation of Exhibit related behavior patterns of primates and carnivores in select Indian Zoos: Its implication in species compatible exhibit design

Principal Investigator : B.C.

Choudhury

Researcher : Avanti Mallapur

This Central Zoo Authority funded project was initiated during October, 1999 in an attempt to document abnormal and stereo-typic behavior of zoo-animals housed in inadequately designed exhibits. Limiting the sampling animals to

primates and small carnivores at twelve different zoological parks in the country, the researcher has documented abnormal behaviors ranging from self-mutilation, begging, listless pacing, masturbation and violent gestures etc. in barren and small enclosures with no structural ecological enrichments. The project will continue the field observations further to document behaviors related to social group size, feeding schedules and methods and interaction with visitors with respect enclosure designs. Based on the findings the project hopes to develop suggestions for improvement in design of zoo enclosures.

Organisation

The Institute completed three research projects and initiated three projects. During the reporting year there were twenty three ongoing projects of which twelve were externally funded. In addition to this, WII completed three projects sponsored under World Bank funded Forestry Research, Education & Extension (FREE) Projects. One Ph. D. was awarded to the researcher of the Institute and six publications were brought out during the reporting year.

DEVELOPMENT
COLLABORATION
UNDP

The GOI-UNDP Sea-Turtle Conservation
Project

The Government of India – UNDP Sea Turtle Project is a national sea turtle conservation project being sponsored by the Ministry of Environment & Forests. The Wildlife Institute of India is the Implementing Agency and coordinates the various sub-programmes within the project. The project was initiated in December 1999 and will continue till December 2001. The project has various components including extensive surveys along the coast, review of legislation and community based conservation, education and awareness, GIS studies of key nesting areas, TED demonstrations and implementation to curtail Sea-turtle mortality and training for wildlife and fisheries managers and field biologists. There is also a component to conduct satellite telemetry studies to document migratory route and diffused foraging areas of the Olive Ridley along the Indian coast.

Surveys

While there is scattered literature for the entire coast on sea turtle nesting, no systematic survey has been carried out and many areas have been ignored. One of the objectives of this programme is to extensively survey the entire coast for sea turtle nesting and mortality with intensive sampling of key areas. Another objective of the survey is to build a coastal network of organizations and individuals involved or interested in marine conservation and fisheries issues who can serve to disseminate and collect information. Surveys have been initiated in most of the states by the following organizations: (i) West Bengal – Nature, Environment and Wildlife Society, Calcutta, (ii) Orissa – Forest Department, Government of Orissa, Bhubaneshwar, (iii) Andhra Pradesh – Wildlife Institute of India, Dehradun, (iv) Tamil Nadu – Salim Ali Centre for Ornithology and

Natural History, Coimbatore, (v) Kerala – THANAL Conservation Action & Information Network, Thiruvananthapuram, (vi) Maharashtra and Goa – Bombay Natural History Society, Mumbai, (vii) Gujarat – Gujarat Institute of Desert Ecology, Bhuj, (viii) Andaman and Nicobar Islands – Andaman and Nicobar Environmental Team, Port Blair.

Other Sub-projects

The Wildlife Institute of India, Dehradun conducted a Rapid Assessment Survey of the impact of the supercyclone (October 1999) with special reference to sea turtle nesting habitats. Enviro Law, New Delhi, is undertaking a review of legislation. Kalpavriksh, Pune is conducting a study of community based conservation in Kerala, Goa and Orissa. Orissa Remote Sensing Application Centre, Bhubaneshwar is using GIS and satellite imagery for the characterisation of sea turtle nesting habitats in Orissa. The Centre for Environmental Education, Ahmedabad will be conducting a workshop to facilitate education and awareness programmes in various states. The Orissa Forest Department and the Wildlife Institute of India, Dehradun plan to conduct a national workshop for sea turtle conservation and management in November 2000.

GOI-UNDP Project-Strengthening Wildlife Management and Ecodevelopment Planning Capabilities in Jaldapara Wildlife Sanctuary

Based on the experiences of initial project and following recommendations of evaluation mission of UNDP, (November 1996), a preparatory assistance mission was fielded to develop proposal for implementation of one of two model plans. The mission prepared a Sub-Programme Support Document on Wildlife Protected Area Management after field consultations. It was approved by project steering committee of UNDP.

The project started functioning in October 1999. The goal of this project is to achieve enhanced conservation effectiveness to strengthen participatory process for implementation of management and ecodevelopment

(development, approval, implementation and monitoring) at the state, district and PA level. The project is trying to integrate the management of the park with the aspirations of the local communities.

The focus of the project is on the process of integrated conservation development through capacity building of the staff and communities, generating baseline information and strengthened support to conservation measures by state government. In March 2000 after getting the first release of the funds under the project, PA Management activities for Park protection could be undertaken. The process of consultations for microplanning were initiated which have to be carried forward during this year.

US-Fish and Wildlife Service

US-Fish and Wildlife Service (US-FWS) has been collaborating with the Wildlife Institute of India on various wildlife conservation programmes since 1977. The collaborative project between WII and FWS, since 1989, has assisted the Institute in upgrading its skills and tools on conducting its training and research programmes in biodiversity conservation. The phase-I of the project was completed in 1994. The phase-II of the project (1995-2000) seeks to test the competence acquired as also to consolidate the gains of the first phase. This is being done through specific projects, broadly directed at management oriented biodiversity research or at developing laboratory or field technology and curriculum.

USDA

The collaborative project with the USDA Forest Service continued during the year under report.

A team of faculty members at WII and representatives of the forest department partners visited various field sites in the United States from July 24-August 7, 1999 to review the new approaches in assessment and planning for biological diversity in forested landscapes. This was of particular significance since the entire scenario addressing planning for biodiversity in

India is rapidly changing to the landscapes based approaches. The gains were two folds. These could feed into a variety of programmes and initiatives. Secondly the field managers had an excellent experience in context of forest and wildlife management plans.

IUCN (World Conservation Union)

The IUCN (World Conservation Union) does not have a country office in India. However, considering the fact that there are over 15 conservation organizations of India who are members of IUCN, the Ministry of Environment & Forests (MoEF) has set up the Indian National Committee to monitor the IUCN related activities by member organizations. The WII was given the responsibility by MoEF, Govt. of India of setting up of the IUCN National Committee Secretariat at the Institute. The Secretariat was set up at WII in early 1999. The main mandate of this secretariat is coordination of the work of Indian National Committee members with respect to the activities of IUCN through its 6 commissions viz. Ecosystem Management; Education and Communication; Protected Areas; Species Survival; Environmental Law; and Environmental, Economic and Social Policy.

Building on RCF-I, the second Regional Conservation Forum aims to bring together the IUCN secretariat, membership organisations, Council and Commission members in Asia on a common platform to move ahead from 1998. The theme of the meeting was "Securing our Future in Asia: the New Century" which clearly defines the direction in which IUCN intends to move in the coming years, and the agenda was developed accordingly.

In order to bring the diverse activities of the IUCN in the region i.e. South and Southeast Asia, the IUCN organises a biennial meeting of its members of the region. The IUCN South and Southeast Asia region on the invitation of Govt. of India had decided to hold the second Regional Conservation Forum (RCF) in New Delhi, India during March 2000. The Wildlife Institute of India was given the responsibility to co-ordinate the 2nd RCF under the guidance of

the Chairman, Indian National Committee and other key members.

SERVICES

CONSULTANCY PROJECTS

Development of Biodiversity Information Module (BIM) for Uttar Pradesh Forest Department (UPFD)

This project was initiated in September 1999. The Wildlife Institute of India entered into an agreement with the Food & Agriculture Organization (FAO) of the United Nations to work on the design and development of a Biodiversity Information Module (BIM), as part of the overall Forest Management Information System (FMIS) being developed in collaboration with the Siemens Information Systems Ltd., (SISL) for the Uttar Pradesh Forest Department (UPFD).

The FMIS being developed for the UPFD seeks to improve the current information management procedures and to mainstream the use of information technology in UPFD activities, particularly the use of state-of-the art database management system and GIS technology. The BIM will address the information management needs of the *in-situ* and *ex-situ* conservation areas and also the managed forest areas. As part of the project, a biodiversity database is also being designed, which will provide comprehensive information on physical, ecological, management and socio-economic attributes pertaining to various categories of conservation areas. Once functional, the BIM will facilitate the preparation of resource inventories and assist in the PA Management Planning and decision-making processes.

Protected Areas Management Planning Guidelines and Training including Regional Planning under India Eco-development Project

The WII and the Director, Project Tiger, Ministry of Environment and Forests, Govt. of India entered into an agreement for providing services for "Protected Area Management

Planning Guidelines and Training including Regional Planning and Regulations" under the GEF - India Ecodevelopment Project. Under this project WII is (i) Reviewing and updating PA Management Planning Guidelines (ii) Providing training to Management Planning Officers (MPOs) of the 7 project sites, (iii) Organizing specialized training workshops and (iv) Developing guidelines to incorporate PA concerns into regional planning process.

A 12-member WII faculty team is currently working on this project which would end in December 2001.

An assessment of need for desiltation of Chambal river within National Chambal Sanctuary

Objectives of the project were: (i) to determine whether extensive siltation has occurred along the Uttar Pradesh part of the Chambal river, and (ii) whether the siltation is affecting the major aquatic fauna and water quality of the Chambal river. Project duration was one month i.e. May 1999.

The National Chambal Sanctuary was created in 1978 for the conservation management of endangered gharial *Gavialis gangeticus* and associated aquatic species. The management of the Sanctuary was of the opinion that in recent years the Chambal River has degraded due to heavy siltation resulting in the loss of habitats for gharial and river dolphins *Platanista gangetica*. Therefore, desiltation is necessary to improve habitat quality. A rapid ecological survey of the most affected 20 km stretch of the Chambal river within the National Chambal Sanctuary between Pinahaat to Useith ghat in Uttar Pradesh was conducted in May 99 to assess the need for desiltation of this river stretch. Results of the survey indicated that there is no major change in the river channel morphology between 1976 and 1999. There is significant increase in the abundance of major aquatic fauna between 1979 and 1999. From the study it was concluded that unless there is significant impact on the wildlife it is detrimental to interfere in the natural process of riverine ecosystems. Attempt to desilt the river may alter

the hydrodynamics of the river that will be detrimental to the wildlife.

India - Ecodevelopment project Under GEF

Mapping of PA and surrounding areas in Pench Tiger Reserve, Madhya Pradesh

The task was initiated in October 1999. Under the GEF-India Ecodevelopment programme, the M.P. State has assigned a one year task to prepare baseline maps of Panch Tiger Reserve (PTR) and surrounding areas consisting of (i) features relevant to PA management and ecodevelopment activities and (ii) defining ecological boundaries of the Panch Tiger Reserve. As envisaged in the agreement, various thematic maps including forest type, compartment, digital terrain model, slope, aspect, contour, drainage, soil type, hydro-geomorphologic features and a general base line map featuring boundaries, village locations, major road net work, distribution of water bodies, and fire lines are under preparation. WII would assist in installation of GIS facilities in PTR and train the staff in using, interpreting and updating of such maps. The interim report of the project has been submitted.

Impact Zone Assessment around Panna National Park

M.P. Forest Department under M.P. Forestry Project gave this project to Wildlife Institute of India. It was aimed to identify the impact zone of the park including quantification of various impacts and suggest strategies to mitigate these impacts.

Duration of the project was one and half years i.e. from June 1998 to April 1999 (extended to December 1999). The main landmarks of this assignment were in-house capacity building of the staff followed by field survey to carry out quantitative and qualitative assessment of impacts. Impact zones of the PA were also found out. This was followed by a workshop to develop possible linkages of the ecodevelopment programme with the existing programmes of other line agencies.

Objectives of the project were: (i) To examine the nature and extent of impact zone around Panna National Park by identifying various types of pressures on the park resources, categorize the magnitude and the extent of such pressures, identify demographic characteristics associated with such pressures and rank these pressures according to the magnitude of their negative influence on the park. (ii) To list possible ecodevelopment activities to address various types of pressures using PRA techniques. (iii) To identify possibilities of dovetailing the programmes of other agencies to meet the objectives of ecodevelopment and to suggest procedures or means to achieve such linkages with various agencies. (iv) To suggest strategies to eliminate or mitigate the pressures that have serious adverse impacts on PA but are not emanating from the resource dependent people. After completing the fieldwork the final report of the project was prepared and submitted to MPFD in December 1999.

The main findings of the report are as following: (i) The impact zone of the Tiger Reserve was about 1346 sq km which extends from 4.5 km to as far as 25 km from the boundary of the PA. Out of a total area of 543 sq km of the Park, only 27.47 sq km is without any significant impact. Rest all the area is under different degrees of impacts of grazing, firewood collection, NTFP collection, weeds, pilgrimage and mining. There are 144 villages in the impact zone out of which 44 fall in the high impact zone. (ii) Depending upon the extent of the impact, type of impact and socio-economic conditions of local communities, the villages could be clustered into 4 groups, which will require different strategies for implementation of the ecodevelopment programmes. (iii) The institution building process started under the project needs to be continued during microplanning which can be done by the spearhead team of the staff of the Park. (iv) There is a need and willingness on the part of different stakeholders for integrating the conservation and development programmes in and around PA. (v) There is an immediate need to demarcate the buffer zone of the PA.

Bibliography on Wildlife and Protected Area Management in the context of Madhya Pradesh

The Madhya Pradesh Forest Department (MPFD) under its World Bank aided Madhya Pradesh Forestry Project had assigned a 10-month task to develop a computerized Bibliography on Wildlife and Protected Area Management in the context of Madhya Pradesh.

Select faculty members and WII's library staff worked for this assignment. During the reporting period, the participating team members were able to finalize the different expected outputs of the assigned task. A multi-prong approach was used to develop the bibliography. The final output—the bibliography for the period 1887-1998 was designed and developed using UNESCO's CDS/ISIS Programme. The bibliography has been named as 'MPBIB' Database.

The final report in the form of printed book includes more than 1500 records. For wider dissemination and use by the scientific community and field practitioners, the bibliography has also been made available through Internet. Hard copies of all the documents were incorporated in the bibliography and sufficient CDs were also made available to the MPFD. This task provided an opportunity to standardize methodology for document search, development of bibliographies and process of computerization.

Environmental Impact Assessment

The Environmental Impact Assessment Cell of the Wildlife Institute of India continued to provide training, consultancy and advisory services to various professional bodies, Government and Corporate organisations.

New Initiatives in Training/Teaching in EIA: The EIA course unit of the Postgraduate Diploma in Wildlife Management was opened for the first time for lateral entrants this year. Eighteen participants registered for the course

against the initial proposal to take only 10 lateral participants. This modular course package for participants from State Forest Departments, Research and Training Institutions, NGOs, Regional Office of MoEF and sister organisations was the first of its kind to have been organised with a specific focus on integrating wildlife/biodiversity concerns in environmental assessments and development planning. This course would continue to remain open for lateral entrants in future.

The academic council of Saurashtra University has introduced the new course unit "Environmental and Social Impact Assessment" in the curriculum of the M.Sc. course of wildlife science subsequent to major revision in course curriculum this year. The course is aimed to initiate capacity building in the field of environmental impact assessment and prepare M.Sc. students to tackle biodiversity concerns and ever increasing challenges of wildlife conservation posed by developmental projects in most sectors.

WII-World Bank-CEC Collaborative Project

Under a collaborative offer of the World Bank and the Canadian Environmental Collaborative Limited work on development of environmental guidelines for road projects has been complete. The final draft of the document "Roads, sensitivities, habitats and wildlife: Environmental guideline" is under the technical review by the environmental experts of the World Bank, Washington DC.

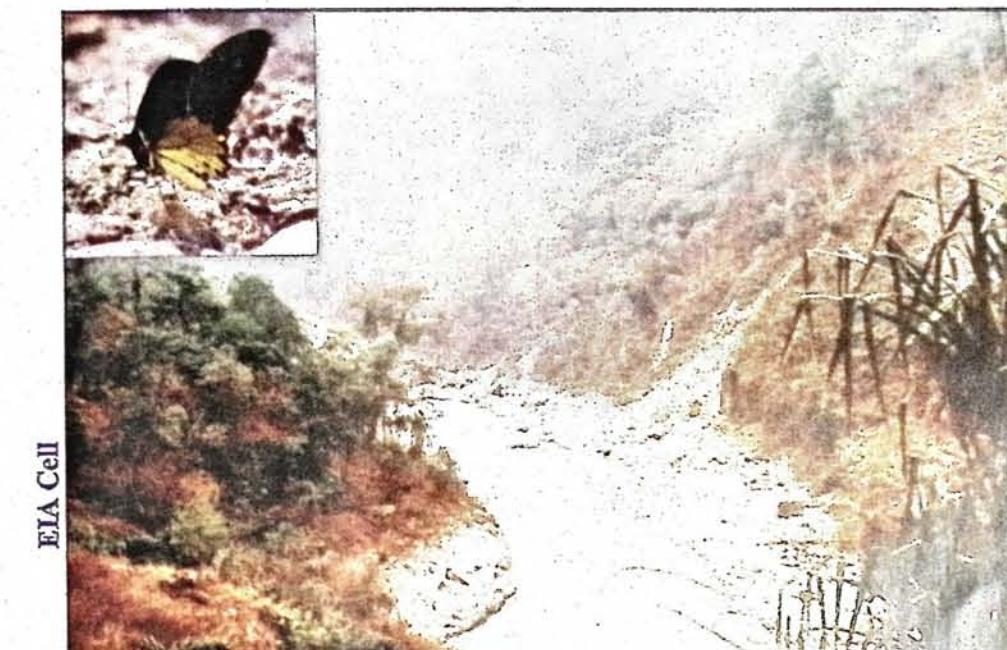
Advisory Role : WII continued to provide advisory services to MoEF on matters related to environmental appraisal of developmental projects. WII continued to represent on the environmental appraisal committees of MoEF for appraisal of river valley and mining projects. In this capacity WII is providing advisory inputs in the evaluation of projects in these sectors. Additionally, WII has also represented in various sub groups constituted for appraisal of sites for highway, mining and river valley projects.

OTHER CONSULTANCIES

Ecological Assessment of Teesta Hydroelectric Project Stage-V, Sikkim

This project was undertaken during October '99 to March 2000 under the consultancy offer of National Hydroelectric Project.

The EIA studies primarily focussed on the assessment of impacts of the project on the biodiversity of the region with special emphasis on butterfly fauna of the area. The final technical report on this EIA study was submitted to NHPC in March 2000.



The EIA study of Teesta Hydroelectric Project Stage-V focussed on the assessment of the project on the biodiversity with special emphasis on butterfly

Evaluation of the Cattle Compensation Scheme (CCS) of WWF - TCP around Corbett, Dudhwa and Palamau Tiger Reserves.

Director, TCP, WWF-India, awarded this consultancy project to the WII during May 1999. The work of one-month consultancy project was initiated and planned to submit the report within stipulated time period.

Under this project, survey was conducted by K.S.Rajpurohit for the evaluation of cattle compensation scheme of WWF-TCP in three National Parks i.e. Corbett, Dudhwa and Palamau between June 21-July 11, 1999. The

final project report with findings and suggestions for the improvement in the WWF-TCP cattle compensation scheme was submitted during September 1999.

Consultation for finalisation of Management Plan for Buxa

On management plan for Buxa V.B.Sawarkar steered the process of completion of management plan for the Buxa Tiger Reserve, West Bengal during April 6-17, 1999. This involved guiding the Management Planning Officer, review of the draft plan, editing and finalizing the document for approval of the West Bengal State Government.

Consultancy for mitigation of animal hazard

Y.V. Jhala attended a meeting with Base Commander of Nalia Air base and sensitized them regarding conservation issues in and around the air-base by taking them out on field trips and involving them in the ongoing research project in Kutch.

International Consultancy Assignment in Sri Lanka

V.B. Mathur was recruited by the Food and Agriculture Organization (FAO) of the United Nations as an International Consultant on Protected Area Planning in the Global Environmental Facility (GEF) Project in the Department of Wildlife Conservation (DWLC), Sri Lanka. As a part of this assignment, 8 Management Plans for National Parks, Wildlife Sanctuaries and Strict Nature Reserves in Sri Lanka were prepared. The Govt. of Sri Lanka has forwarded these plans to the overseas donor agencies to secure funds for their implementation.

TEACHING INPUTS TO OTHER INSTITUTIONS

WII and IGNFA have entered into a collaborative arrangement under which WII faculty members are providing enhanced inputs in classroom and in the field. As part of this arrangement a wildlife techniques tour was organized for the IFS Probationers of the 1997-2000 batch at Corbett

(Wildlife) Training Centre from February 21-25, 2000 to provide hands-on experience. It is also proposed to organize a 3-week specialization module on "Biodiversity Conservation and Wildlife Management" for the IFS Probationers of the 1998-2001 batch in May 2000.

S. No.	Place	Name	Date	Topic
1.	IGNFA, Dehradun	V.B.Sawarkar	May 6, 1999	Principles of Wildlife Management
2.	SFS College, Dehradun	V.B.Sawarkar	May 24, 1999	Addressing biodiversity in production forests
3.	SFS College, Dehradun (Course organised by ICFRE, Dehradun)	P.K. Mathur	3 lectures during May 3 - July 30, 1999	Concept and principles of biodiversity conservation; grasslands diversity and management; wildlife research in India
4.	FRI Deemed University, Dehradun	B.K. Mishra, A.K. Bhardwaj, Ruchi Badola	May 24-28, 1999	Ecodevelopment for biodiversity conservation
5.	SFS College, Dehradun	A.K. Bhardwaj	June 10, 1999	Participatory Management of Protected Area
6.	Forest Survey of India, Dehradun	V.B. Mathur	June 22, 1999	Preparation of Management Plans using Remote Sensing and GIS Technology
7.	SFS College, Dehradun	A.K.Bhardwaj	June 25, 1999	Ecodevelopment - A case study from Periyar
8.	IGNFA, Dehradun	Asha Rajvanshi	July 15, 1999	EIA - Concepts and Practice
9.	IGNFA, Dehradun	V.B.Sawarkar	July 22, 1999	Wildlife Management in PAs and production forests
10.	IIRS, Dehradun	V.B. Mathur	September 22, 1999	GIS Applications in Environmental Impact Assessment
11.	IGNFA, Dehradun	Ruchi Badola	September 30, 1999	Community Participation
12.	SFS College, Dehradun	P.K.Mathur	November, 1999	Regional management planning

13.	UN Centre for Space Science & Technology Education for Asia-Pacific (CSTTE-AP), Dehradun	V.B. Mathur	November 16, 1999	GIS Applications in Wildlife Conservation
14.	SFS College, Dehradun	V.B.Sawarkar	November 16 & 25, 1999	Wildlife Management in production forests
15.	SFS College, Dehradun	A.K.Bhardwaj	November 19, 1999	Ecodevelopment Planning
16.	SFS College, Dehradun	P.K.Mathur	November 29, 1999	Preparation of management plans for wildlife and protected areas
17.	SFS College, Dehradun	B.C.Choudhury	November, 1999	Reptilian biodiversity
18.	SFS College, Dehradun	R.S.Chundawat	November, 1999	Conservation of snow leopard
19.	SFS College, Dehradun	A.K.Bhardwaj	December 3, 1999	Planning for ecodevelopment projects
20.	Department of Zoology, Gujarat University	Y.V. Jhala	January, 2000	Wildlife research case studies
21.	St. Joseph Academy, Dehradun	Asha Rajvanshi	January 28, 2000	Environmental pollution
22.	Shri Guru Ram Rai (PG) College, Dehradun	P.K.Mathur	February 19-28, 2000	Wildlife conservation in India
23.	IGNFA, Dehradun	Asha Rajvanshi	February 11, 2000	EIA : Concepts and Practice
24.	IGNFA, Dehradun	P.K.Mathur	February-March 2000	Wildlife in managed forests
25.	M.K.P. (PG) College, Dehradun	P.K.Mathur, V.B.Mathur, A.K.Bhardwaj, K.Sankar, B.S.Adhikari and Bivash Pandav	March 2, 2000	The concepts and principles of biodiversity conservation, habitat evaluation, ecodevelopment and captive breeding and zoo management
26.	M.K.P. (PG), College, Dehradun	S. Wilson	March 5 & 7-8, 2000	Nature photography; audio-visual presentation
27.	IGNFA, Dehradun	B.S. Adhikari	March 29, 2000	Vegetation sampling and monitoring techniques for wildlife habitat evaluation

FACILITIES

PROTECTED AREA NETWORK CELL

The Protected Area Network Cell (PANC) provided inputs in updating the Protected Area Database on the network of National Parks and Wildlife Sanctuaries in the country. The significant achievement of the PANC was the production of the revised and updated document "Wildlife Protected Area Network in India: A Review". Using state-of-the art GIS mapping facilities the Biogeographic Zone and Province maps were produced. The Executive Summary of this document was released by Shri Suresh Prabhu, Honourable Union Minister for Fertilizers and Chemicals in the Valedictory Session of the IUCN Regional Conservation Forum (RCF) in Vigyan Bhawan, New Delhi in March 2000.

ENVIS CENTRE

The Environmental Information System (ENVIS), Centre at Wildlife Institute of India was setup in September, 1997 and is part of the ENVIS network of the Ministry of Environment and Forests, Government of India. This centre deals with general matters pertaining to "Wildlife" and specifically those relating to "Protected Areas". The III issue of the ENVIS Bulletin on "Indian Crocodilians" was published in June 1999. This issue was brought out to commemorate 25 years of the Indian Crocodile Conservation Project. With the earlier ENVIS Bulletin on "Small Cats of India" the WII ENVIS Centre has completed a review of the status of knowledge on small carnivores of India. The ENVIS Bulletins are being sent to over 1,200 individuals in India and abroad.

NATIONAL WILDLIFE DATABASE CELL

The objectives of the computer-based National Wildlife Database are to: (i) Provide readily accessible and comprehensive information on the conservation status of biogeographic regions, habitat types, individual animal species and the network of protected areas in the country; (ii) Establish linkages with researchers,

protected area managers and planners and also with other data centres; and (iii) Facilitate research and training activities in wildlife by providing bibliographic references on protected areas, habitat types and animal species.

During 1999-2000, the main thrust of the activities was on data collection, input and its validation. The Protected Area Database was updated further and porting of the information from the FoxPro to Oracle RDBMS has been almost completed. Presently, there are 566 protected areas including 87 National Parks and 479 Wildlife Sanctuaries in India, covering 154,231.73 km² which is 4.69% of the total geographical area of the country. More than 325 user queries were attended and outputs in various formats were provided. Bibliographic database was also updated and cross-checked. A web page on the National Wildlife Database has been developed and has been linked to the Institute's home page.

A 'Directory of Contact Addresses of the Protected Area Managers' in the country has been compiled which is being published by the ENVIS Centre on "Wildlife and Protected Areas" at WII. The Database Cell also prepared various technical reports and bibliographies, i.e. Directory of Protected Area Profile for each State, Bibliography of Protected Areas of India including Tiger Reserves & Biosphere Reserves and Bibliography on selected mammalian species. The major contribution of the Database Cell was in bringing out the Executive Summary "Wildlife Protected Area Network in India: A Review" which was released during the IUCN Regional Conservation Forum (RCF) in New Delhi from March 21-25, 2000. Poster exhibits for the RCF on Institute's activities were also prepared by the Database Cell.

COMPUTER & GIS FACILITY

During 1999-2000, the computer facility of the Institute was further strengthened.

Y2K compliance of computer hardware / software: The Institute has more than 130 computer systems ranging from 386/486/

Pentium based PCs, notebooks to Sun workstations. All the PCs were thoroughly tested by using various Y2K compliance testing software, approved by NSTL (National Software Testing Laboratory Inc.,) USA. Out of thirty 386 systems installed in the Institute, twelve 386 machines were upgraded to HP Celeron system on buy-back scheme and the remaining eighteen machines were made Y2K ready by installing millennium card in them. The Y2K roll over was smooth and perfect and was achieved without any glitches.

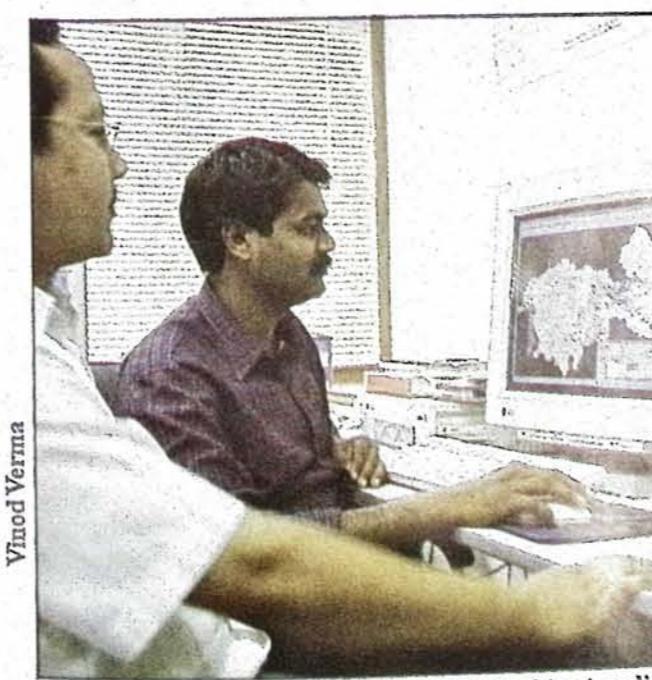
Hardware and Software Procurement/ Upgradation: Sun Ultra5 and ultra10 workstations were procured for the GIS laboratory to meet the increasing need of the users. Two Compaq Pentium III PCs, sixteen HP Brio Celeron machines and HP Omnibook 4150 notebook with 64MB RAM, 10GB HDD, DVD drive, fax/modem/LAN card were procured. Twelve old 386 systems were upgraded to HP Brio Celeron machines through a buy-back scheme. Three HP Laserjet 2100TN laser printers, eight inkjet printers, nine dot matrix printers and eighteen APC 650VA UPS systems were also procured. The LAN cabling in the GIS laboratory was upgraded. One Digital Pentium machine of EIA cell was upgraded to 128MB RAM and with an additional hard disk of 6.4GB.

GIS software package Arc/Info was upgraded from 3-user node lock license to 4-user floating license for the four Sun workstations thus allowing these workstations to run the Arc/Info software independently. ArcView extension 3D Analyst; Adobe Graphics Studio which is an integrated package consisting of Photoshop 5.5, PageMaker 6.5, Illustrator 8.0 and Acrobat 4.0; Adobe Premiere 5.1; Macromedia Director 7.0 and Stellar data recovery software were also procured.

Training : The Computer/GIS Centre conducted computer-training courses to the students, researchers and officer-trainees of the wildlife management courses. Training was conducted on concepts of computer, LAN/ Internet, software packages viz. MS Windows 95/98, MS-Office, SPSS and S-Plus and specialised software packages related to wildlife research. Training was also conducted on Geographical Information System (GIS), Remote Sensing (RS) and Global Positioning System (GPS) technology by giving hands-on training on software packages Arc/Info and ArcView for GIS and ERDAS Imagine for digital image processing of remotely sensed data.

Visitors : A large number of visitors come to the Computer/GIS Centre of the Institute to learn about various applications and also about recent developments in computer hardware/ software. Shri Suresh Prabhu, former Minister of Environment and Forests, Government of India, Dr. D.P. Rao, Director, NRSA, Hyderabad, participants of workshops conducted by the Institute, officer-trainees of IIRS, FSI, IGNFA and SFS College, students of IIFM, Bhopal, range officers of state forest departments visited the centre during the year.

Application of GIS/RS/GPS in Research Projects: Geographic Information System (GIS), Remote Sensing (RS) and Global Positioning System (GPS) technology is being used in most of the research projects of the Institute for wildlife research and conservation. In the reporting year, 13 research projects used GIS/RS/GPS technology.



Preparation of vegetation map of Uttarakhand using digital image processing techniques in GIS/RS laboratory.

LIBRARY AND DOCUMENTATION CENTRE

The Library and Documentation Centre (L & DC) at WII is considered to be a major repository of literature relevant to wildlife science and management in the Indian Sub-Continent. It is also establishing and maintaining links with other national information system in India and other countries to ensure free flow of information at national and international level. The L & DC has 18000 books, 165 conference proceedings, 321 theses & dissertations, 108 standards and more than 5000 bound volumes of old and rare journals. The library also maintains good collection of scientific paper numbering 8000. It subscribes to more than 321 periodicals. During this year, 1090 books, proceedings, theses & reports, 300 scientific papers and reprints, 500 press clippings & four new periodicals and a CD-ROM database have been added to the library collection. The L & DC is fully computerized, using LIBSYS Library Management Software, UNESCO'S CDS/ISIS Software, CD Server, Barcode and related technologies. For optimum resources use by researchers, students, officer trainees and other users, 18 computer terminals available in the library premises and the Faculty desks have been inter-connected with a LAN. Being connected to the library facility, the users can access all in-house databases like books, reprints, Indian wildlife abstract, map/toposheet collection, press clippings, specialized bibliographic databases on Musk Deer, application of telemetry in wildlife, wildlife and protected area management in Madhya Pradesh, etc. Users also have access to CD-ROM databases like Wildlife Worldwide 1935 onwards, and E-CD. CAB Spectrum 1973 available on the LAN.

Services provided during 1999-2000

S.N.	Services	Numbers
1.	Photocopy exposure	1,79,655
2.	Books circulation	8354
3.	Database search request	130
4.	Inter library Loan	30 books
5.	References query	300 (appx.)
6.	Document delivery	30 Clients
7.	Document procurement request	10 (Reprints)

Revenue Generation from services during 1999-2000

S.N.	Services	Amt. (Rs.)
1.	Bibliographical Reference	572.00
2.	Photocopying Service	12142.00
3.	Document delivery	2100.00

Volume Added to Library Collection during 1999-2000

Sl.No.	Types of document	Numbers
1.	Books & Monographs	1090
2.	Journals/Periodicals	4
3.	Newspaper clippings	500
4.	Reprints	300

WII RESEARCH LABORATORY

WII research laboratory provides technical inputs to research projects, various ongoing courses and consultancy projects in teaching, training and analytical work. The instrumentation facility in laboratory will be improved shortly by the purchase of a new UV-VIS spectrophotometer and dry block digester. During the reporting year 5-research projects, 1 M.Sc. dissertation and 2 consultancy projects utilized the analytical facility of WII laboratory for the determination of various analytical parameters of plant and soil samples. The laboratory staff provided technical inputs in capturing and handling animals in field, demonstration of various traps, electric fence and radio telemetry equipment to various training programs. The laboratory also provided services to U.P. Forest Department for the collection of water samples from Chambal River and determination of its physico-chemical properties. Teaching classes followed by practical for ongoing courses were conducted at the laboratory on various instrumentation and analytical techniques. This included herbivore pellet and carnivore scat analysis, age and sex determination of animals, analysis of water samples for some parameters.

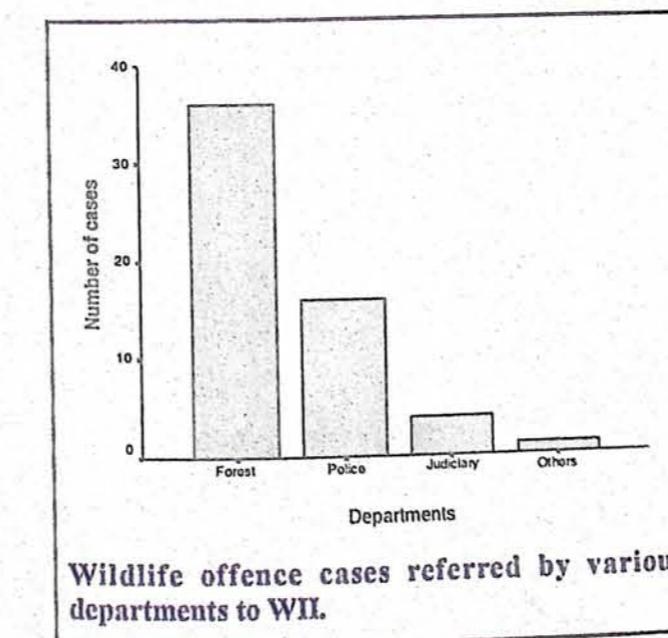
A user friendly and menu driven computer software 'Laboratory Management Information System' (LAMIS) for the effective management of laboratory activities was developed using Oracle and Developer 2000 software with the help of an MCA student from Jorhat Engineering

College, Assam University. This software has two modules i.e. inventory control and project information system. The inventory control system comprises, item registration & its issue and return, borrower registration, supplier registration, information of sully order and delivery of items and entry for broken and damage items. The project information system provides information about projects utilizing laboratory facilities and results obtained. Using this software various reports on inventory information, stock details, item values, analytical activities can be generated. Inventory information of more than 2000 laboratory and field equipment are being entered in this program.

A permanent meteorological station was installed last year in the Chandrabani campus. The laboratory staff regularly collects data on rainfall, temperature, humidity and wind velocity and direction. The mean minimum and maximum temperature recorded in last year (Jan to Dec) was 11 °C and 32.41 °C respectively. The highest and lowest temperature recorded was 40 °C and 3 °C respectively. The total annual rainfall recorded was 1328 mm.

WILDLIFE FORENSIC LAB

One of the mandates for newly established Wildlife Forensic Lab at the Institute is to standardize techniques to identify species from



various parts and products sent by enforcement agencies under wildlife offences. Fifty-seven wildlife offence cases were received, of which 63 and 38 percent were from forest and police departments respectively (Fig1). Wildlife parts seized under wildlife offences were claws, skins, bones, hair antler, meat canine and other finished products. Sixty-percent cases were from states of Uttar Pradesh and Madhya Pradesh.

WILDLIFE POLICY RESEARCH CELL

In response to a felt need of providing researched and collated information on issues relating to the conservation and management of wildlife and its habitat in the country that would facilitate the wildlife policy and action plan formulation process, a Wildlife Policy Research Cell (WPRC) was established in March, 2000. The mission of the WPRC is to (i) Identify and assimilate wildlife conservation and management issues, practices and approaches at the regional, national and state level, (ii) Provide a forum to discuss and confront issues related to wildlife conservation, (iii) Create a learning resource centre related to wildlife conservation and management to facilitate policy making and disseminate information through best practice guides and occasional papers, (iv) Link up the above with capacity building and interpretive programmes and (v) Recommend approaches for mitigation of PA-People-Wildlife conflicts. The WPRC is in the process of recruiting Project Associates. A work plan for the WPRC for the year 2000-2001 has been formulated under which a discussion forum on 'Developing innovative strategies to deal with Man-Animal conflict' will be organized during the Annual Research Seminar in September 2000.

HERBARIUM

During the reporting period the staff of WII Herbarium continued to assist in completing the floral inventory of Rajaji-Corbett corridor area, Garo hills (Meghalaya), Pakhui Wildlife Sanctuary (Arunachal Pradesh) and Kalakad-Mundanthurai Tiger Reserve (Tamil Nadu). A total of 700 plant species were identified and processed. Inventory and microhabitat

characterization of campus flora is in progress. A total of 38 plant species were added to the campus flora making it to over 430 species. One of the Herbarium staff was deputed to the Herbarium of Forest Research Institute Dehra Dun for a period of 7 days to undergo a short training on Management of Forest Herbarium and Arboratum. The staff also assisted in Biodiversity characterization in the Western Himalaya (DOS-DBT project), and vegetation surveys in the Garo hills that resulting in the collection and identification of ca 1000 species of plants. The Herbarium staff has also been assisting in various field exercises pertaining to vegetation and wildlife habitat surveys for different training courses.

AUDIO-VISUAL UNIT

The audio-visual unit of the Institute caters to the various requirements of the academic activities, training programmes, workshops and seminars by providing support of audio-visual equipment. The unit has video & 16mm-film library and a slide library consisting of over ten thousand slides. The unit has a large number of audio-visual equipments, a VHS video camera, wide range of still camera and accessories, slide projectors, overhead projectors, 16mm

projectors and LCD video projector for panoramic projections which are extensively used for teaching purpose. About 500 transparencies and four video films were added to this unit. The Institute's audio-visual programme "We are nature, Nature is our world" was screened in the honour of the Minister of Environment & Forests, several dignitaries and participants. In all eleven number of AV shows were screened during the year.

The Institute organised a Photo Exhibition on 'Biodiversity and its Conservation' at FRI campus on the occasion of World Environment Day i.e. June 5, 1999 and World Forestry Day on March 21, 2000. Mini workshop in Nature Photography and mini workshop in preparing audio-visual programme for the participants of Interpretation & Conservation Education Course, XXI Diploma course and for the students of M.K.P. College, Dehradun was organised.

PUBLICATIONS

As part of the information dissemination programme, WII published the following:

- * ENVIS Bulletin, Vol.2, No.1,



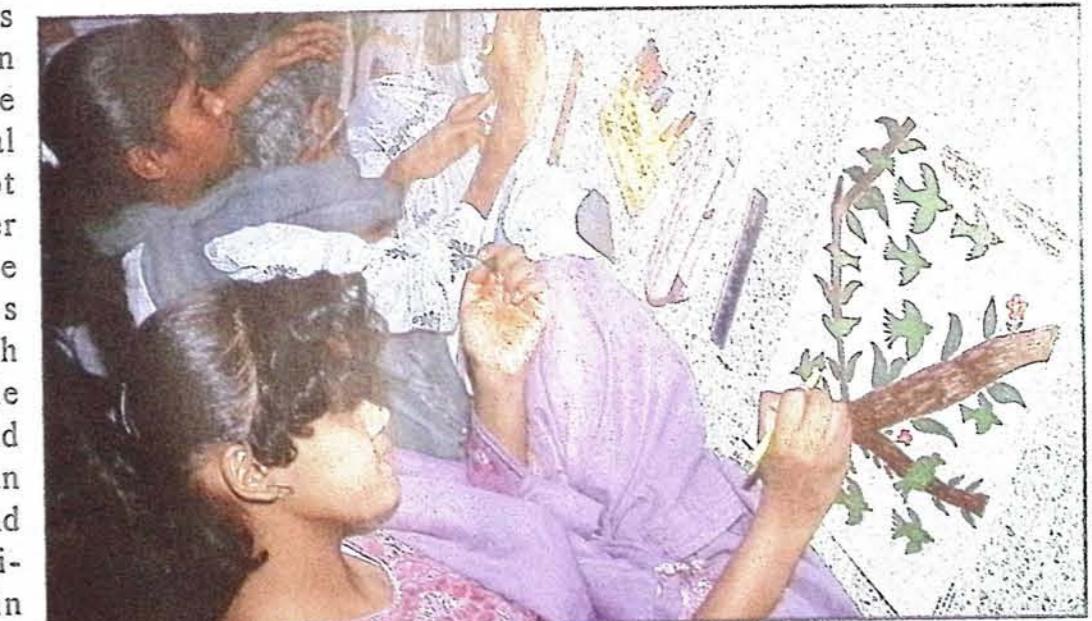
Publications of WII during the year.

- * Wildlife Protected Area Network in India: A Review (Executive Summary)
- * Bibliography on Wildlife and Protected Area Management in the context of Madhya Pradesh.
- * Ecology and Conservation of Asiatic Ibex in Pin Valley National Park, Himachal Pradesh, India.
- * Status, Ecology and Conservation of Malabar Giant Squirrel, *Ratufa indica*.
- * Distribution, abundance and ecology of the Indian Sarus Crane (*Grus antigone antigone*) in India, Report of an all- India survey 1998-99.
- * WII Newsletter Volume 6 No.1 & 2.
- * WII Newsletter Volume 7 No.1 Spring 2000.

OTHER ACTIVITIES

Sports

The VIII All India Forest Sports Meet was held this year in Chennai during February 10-13, 2000 in which 27 teams participated from states, UT's and Institutions. WII's contingent of 30 members participated in cricket, lawn tennis, table tennis, rifle shooting, carom, badminton, billiards, shot put and discuss throw. The WII bagged one gold medal (women's badminton doubles) and one bronze medal (women's shot put). Other credible performances included 4th position in rifle shooting and men's veteran lawn tennis and reaching semi-final stage in women's badminton singles.



On the spot drawing and painting competition organised during wildlife week.

World Environment Day

The World Environment Day was celebrated in a befitting manner. Speciality of this year's programme was the initiation of a project called "Wildlife Watch" by the school children of Chandrabani village. B. K. Mishra acquainted the children in identifying sign and evidences of various wild animals and birds, so that they could monitor the presence of these animals around their village in different time of the year. Beside this, the children also participated in drawing; extempore debate and environmental quiz competition organised by the Institute.

Van Mahotsava

During the Van Mahotsava celebration, the Institute did tree planting in Chandrabani village school. B.K. Mishra organised this programme.

Wildlife Week

A group of twelve students of class IX of Kendriya Vidyalaya, Clement Town accompanied by their teachers visited the Institute on October 1, 1999. They were taken around the Nature Trail within the campus by Pratap Singh and were given the general exposure of the Institute and shown different species of birds within the campus.

A drawing and painting competition was organised for the children of the Institute employees, on October 3, 1999 to commemorate the wildlife week in the Institute. On October 8, 1999 Rajeev Bhartari participated in the meeting of the Nature Club of St. Joseph Academy, Dehradun. The school children were shown a video film titled 'Corbett at sixty'.

The students of class IX & X from Welham Boys St. Joseph Academy, Hilton School and Brightland schools visited the Institute on October 8 and 11, 1999. The programme was organised by the Friends of Doon Society and WII on the occasion of the Wildlife Week. Total



A view of the newly constructed additional modular institutional block at WII.

160 students and teachers participated in the visit. Four researchers of the Institute delivered slide talks on amphibians, reptiles and turtles. A synchronised slide programme titled 'Wonderful World of Snakes' was screened for the benefit of the students. The researchers caught a Cobra for demonstration before the students and later the snake was released in the campus.

Flower Show

This Institute participated in the flower show held at Dehradun Club on March 26, 2000. The

Institute won 4 trophies, 29 prizes in eight different categories and Rs. 100 cash award.

Campus Development

The construction work of Additional Modular Institutional Block at WII Chandrabani, Dehradun having basement, ground floor and mezzanine floor for housing a computer center, forensic laboratory, accommodating faculty, research associates and support staff besides lecture rooms and health laboratory has been completed at an approximate cost of Rs 192 lacs. Construction of rigid pavement in loop road in front of New Hostel Block was undertaken

and completed at an executed cost of Rs 2.85 Lacs. Construction and provision for installation of Stand-by-Generator Set 250 KVA capacity was completed during the year at an approximate cost of Rs 2.6 Lacs. External electrical supply for additional

modular institutional block was taken up. The work has also been completed at an approximate cost of Rs 4.97 Lacs.

Activities of the Vigilance Unit

As laid down by the Central Vigilance Commission, Government of India, a Senior Faculty Member discharges the functions of the Chief Vigilance Officer for the Institute. The activities of the unit are as per the laid down procedures. During the reporting period, there were no cases pending, contemplated or decided.

Visitors

During the year the Institute got the opportunity to welcome some very important dignitaries. Shri Suresh P. Prabhu, Honourable Union Minister, Environment & Forests; Shri Babu Lal Marandi, Minister of State, Environment & Forests, New Delhi; Shri Ratnesh Solomon, Minister of Forests, Government of Madhya Pradesh; Shri Samar Singh, Secretary General, WWF-India, New Delhi; Dr. N.L. Ved, Vice Chancellor, Saurashtra University, Rajkot, HE Mr. Pham Sy Tam, Ambassador Extraordinary Plenipotentiary of the Socialist Republic of Vietnam at New Delhi; Mr. Pham Van Vu, Science Counsellor and Mr. Le Viet Duyen, Attaché; Shri Pradeep Kumar, IAS, Advisor Environment & Forests, Planning Commission, New Delhi; Mr. Mahinda Rajapaksa, MP, Minister of Fisheries and Aquatic Resources Development, Govt. of Sri Lanka, Colombo; Vice Admiral Mihir K. Roy, PVSM, AVSM (Retd.) and Ms. Promilla Issar, Convenor & Secretary, Wildlife Protection, Haryana, Secretariat, Chandigarh visited WII.

Study Tour of Wildlife Officers from Sri Lanka

The Wildlife Institute of India organized a study tour for the wildlife officers of the Department of Wildlife Conservation, Government of Sri Lanka during October 3-November 2, 1999. Thirty officers accompanied by two faculty members of the National Wildlife Training Centre, Giritale participated in the study tour programme, which was sponsored by the FAO-UNDP under the Global Environmental Facility (GEF) Project in Sri Lanka.

Faculty and other recruitment

A.K. Gupta as Scientist-SG, Rajiv Bhartari & S.K. Srivastava as Scientist-SF and S.B. Banubakode as Scientist-SE joined WII by transfer on deputation on Foreign Service. V.P. Uniyal, Yashveer Bhatnagar, B.S. Adhikari and Jagdish Krishnaswami were appointed as Scientist-SD. Bivash Pandav, K. Vasudevan,

Park, and National Museum of Natural History, New Delhi. Since 1994, the WII has been involved in the capacity building of the Department of Wildlife Conservation, Sri Lanka and over 100 officers including frontline staff have been trained by the WII.

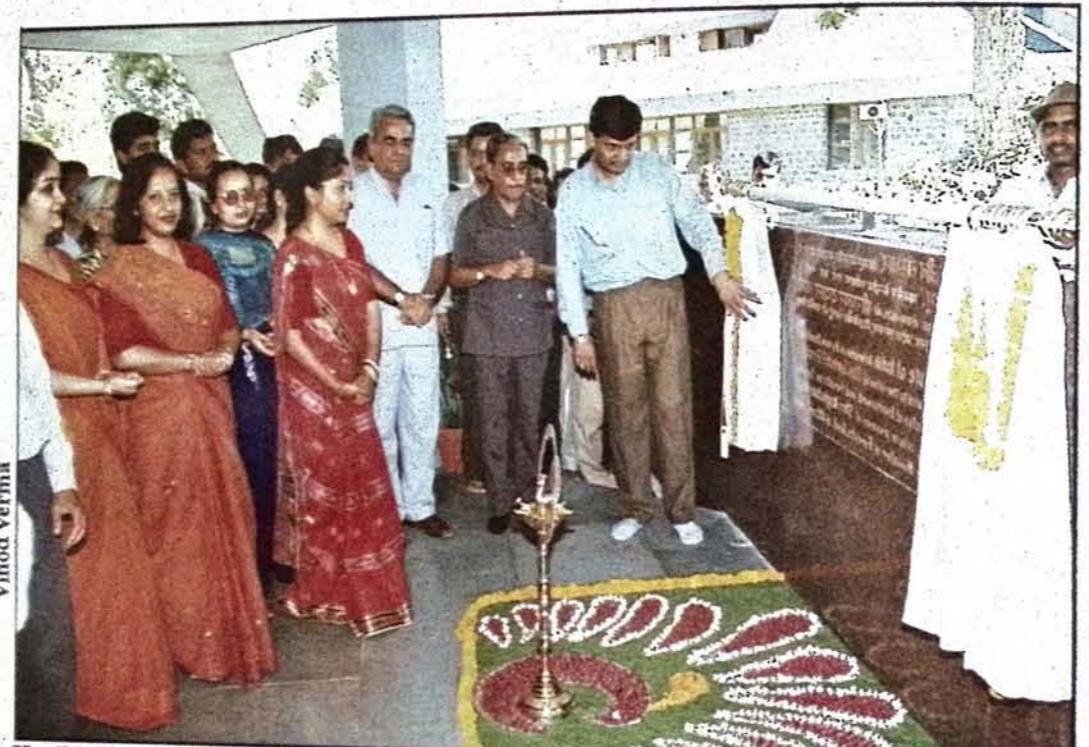
Study tour to India by Senior Officers of the Department of Wildlife Conservation, Sri Lanka

The WII organized a study tour programme for Mr. A.P.A. Gunasekera, Director, Department of Wildlife Conservation, Sri Lanka and Mr. P. Weerahandi, Senior Assistant Secretary, Ministry of Public Administration, Government of Sri Lanka during January 2-February 22, 2000. Both the senior officers from Sri Lanka interacted with WII faculty and staff and got a first hand exposure to the various training and research activities of the Institute. They also held discussions with the Director, Indira Gandhi National Forest Academy, Forest Survey of India, Indian Institute of Remote Sensing, WWF (India) and learnt about their mandates and programmes. They also visited Keoladeo National Park, Kanha Tiger Reserve, Indira Gandhi Wildlife Sanctuary, Parambikulam Sanctuary and Periyar Tiger Reserve and studied about the management practices relating to Habitat Management, Protection, Ecodevelopment, Tourism and Elephant Management. This study tour marked the end of the 1st phase of Technical Cooperation between WII and DWLC which began in 1994 and was sponsored by the FAO-UNDP under the Global Environmental Facility (GEF) Project in Sri Lanka.

K. Sivakumar and Praveen Singh were appointed as Scientist-SC. Qamar Qureshi was promoted to Scientist-SE with effect from July 1, 1999. In addition to this K.K. Shrivastava was appointed as Editor. Mahesh Tyagi was appointed as Junior Engineer. Sudha Jain joined as Stenographer Grade-II by transfer on deputation on foreign

service. Sugato Dutt, IFS, B.M.S. Rathore, IFS, D.V.S. Khatri, IFS and Ajai Saxena, IFS have been repatriated to their respective parent departments on completion of their tenure of deputation period at WII. K. Narsingh Rao, Farash was transferred to another department at Hyderabad as per his request.

Perspective 2000 -2001



Vinod Verma

Hon'ble Union Minister of Environment & Forests, Government of India, unveiling the stone laid for dedication of WII campus to the nation.

Induction of some scientific and technical personnel in the Institute and addition of the new institutional building helped us to plan for an increase in the range of training programmes catering to the needs of Indira Gandhi National Forest Academy, State Forest Departments, Non Governmental Organisations, Library professionals and other agencies.

The Master's Course in Wildlife Science and Post Graduate Diploma in Wildlife Management, Certificate Course for junior field staff and Zoo management course, will continue as regular activities of the Institute.

A series of training programmes is being planned for field staff of seven GEF sites under India Ecodevelopment Project. We also plan to conduct Regional Planning workshops for Biodiversity Conservation. The workshops for Regional Planning are going to be a follow up action of the collaborative national workshop conducted last year with Lal Bahadur Shashtri National Academy for Administration (LBSNAA).

Year 2001 has been declared the year of mountains and as our contribution to this theme, we are planning to enlarge our activities in assessing and monitoring of biodiversity in ecologically sensitive areas in western and trans-himalayan region in collaboration with concerned states under our ongoing Himalayan Biodiversity Project.

In the emerging field of Ecotourism also, WII has plans to conduct a series of national training workshops and to organise one International Training Workshop (In collaboration with Australia-India Council and Australia

Conservation Training Institute) in its attempt to enhance capacity building in the field of ecotourism.

For coastal areas, several programmes have been planned including the All India Survey for marine turtles under aegis of WII-MoEF-UNDP project and similarly with National Wetland Committee support, a training programme is being developed for wetland ecosystem management plan development.

The Institute also plans to consolidate the gains achieved through setting up of the Indian Wildlife Health Co-operative with 5 Veterinary Institutions of the country. A training workshop for faculty members of veterinary colleges and participatory development of a syllabus on wildlife health management meant for veterinary institutions is on the workshop agenda.

In the field of research all ongoing research projects will continue. The other new research projects we plan to take up are on the ecology of otters particularly looking at habitat use pattern and also on ecology and resource utilization of hog deer in relation to other sympatric species.

Our plans also include of bringing out some useful publications on wildlife science and some manuals on park management and updating of some existing manuals.

Campus development activities will continue and the civil work for the much-needed Seminar Hall cum Interpretation Centre will be completed during the year. We also plan to launch our new website for the Institute during this year.

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Ph.D. Awarded

Forest Research Institute (Deemed University) awarded Ph.D. in Wildlife Management to Yogesh Dubey under the guidance of Dr. V.B.Mathur in October 1999. Title of the thesis was "Application of Geographic System in Assessing Habitat, Resource Availability and its Management in Tadoba-Andhari Tiger Reserve."

Accounts

25. Dr. P.K. Mathur
Special Invitee
Scientist-SG (Education)
Wildlife Institute of India
Dehradun-248001

26. Dr. Atul Kumar Gupta
Special Invitee
Scientist-SG (A)
Wildlife Institute of India,
Dehradun - 248001

Finance Committee:

1. Shri C.P. Oberoi, IFS
Chairman,
Inspector General of Forests,
Ministry of Environment & Forests,
Paryavaran Bhavan, 'B' Block,
CGO Complex, Lodi Road,
New Delhi - 110 003

2. Shri J.C. Daniel,
Retd. Curator, BNHS
(Chairman, TRAC, WII),
16/186, Chander Niwas, Seon (East)
Bombay - 400 022

3. Shri S.C. Sharma, IFS
Addl. Inspector General of Forests
(WL) & Director Wildlife Preservation,
Ministry of Environment & Forests,
Paryavaran Bhavan, B-Block,
CGO Complex, Lodi Road,
New Delhi - 110 003

4. Dr. Ishwar Dass
(Member WII-Society),
E-1/154, ARERA Colony
Bhopal - 462 016

5. Shri Jivtesh Singh Maini, IAS
Joint Secretary (Finance),
Ministry of Environment & Forests,
Paryavaran Bhavan, B-Block,
CGO Complex,
Lodi Road,
New Delhi - 110 003

6. Shri V.B. Sawarkar
Additional Director,
Wildlife Institute of India
Dehra Dun -248 001

7. Shri S.K. Mukherjee
Member-Secretary
Director,
Wildlife Institute of India
Dehradun - 248001

Building Committee:

1. Director General,
Chairman,
Indian Council of Forestry
Research and Education,
New Forests,
Dehradun

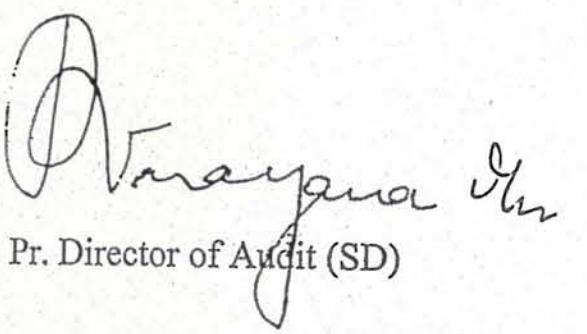
2. Chief Engineer,
Member,
Civil Construction Unit,
Ministry of Environment & Forests,
New Delhi

3. Director,
Member-Secretary,
Wildlife Institute of India,
Dehradun

AUDIT CERTIFICATE

I have examined the Receipts and Payments Account, Income and Expenditure Account for the year ended 31st March, 2000 and the Balance Sheet as on 31st March, 2000 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 Wildlife Institute of India, Dehradun according to the best of information and explanation given to me and as shown by the books of the organisation.

Date : 20.2.2001
Place : New Delhi



Pr. Director of Audit (SD)

Wildlife Institute of India

Balance Sheet as on 31-3-2000

FUNDS & LIABILITIES	As on 31-3-99	Additions during 99-2000	As on 31-3-2000	As on 31-3-99		Additions during 1999-2000	As on 31-3-2000
				ASSETS	Liabilities		
Excess of Income over expenditure	30338876.14	-6091990.55	24246885.59	Land	6607214.65	0.00	6607214.65
Pension Fund	6278880.25	-183062.00	6095818.25	Trees	2432709.00	0.00	2432709.00
GP Fund	6233976.03	5711784.00	11945760.03	Avenue Plantations	2889318.15	288620.00	3177938.15
Amount Capitalised	218546007.78	18568691.29	237114699.07	Campus Development	5375619.31	210450.00	5586069.31
CGEGIS Refund	16423.90	-16423.90	0.00	Lab equipment	1404516.07	28431.00	1432947.07
				Furniture & Fixtures	8140282.44	163933.00	8304215.44
Security Deposit	1064641.95	-338939.00	725702.95	Vehicle	5626247.21	2802368.84 -2709705.55	5718910.50
8. Withheld Amount	19393.00	-19393.00	0.00	Library books	9977292.28	1067584.00	11044876.28
				Office Equipment	5064567.90 558771.34	-36457.00 0.00	4700110.90 558771.34
				Camp Equipment	94202.00	94202.00	
				Photographs & equipments	2092587.20	44886.00	2137473.20
				Materials and supplies	3863727.95	0.00	3863727.95
				Educational films	1080432.35	0.00	1080432.35
				Journals & Periodicals	14703691.00	1927171.00	16630862.00
				Training equipment	22420015.24	1614797.00	24034812.24
				Boundary Wall	1446200.59	0.00	1446200.59
				Boundary fencing	817934.93	0.00	817934.93
				Building complex	106342229.00	12163037.00	118805266.00
				Architectural & supervision fee	6626513.85	226860.00	6853373.85
				Carried Over	251084889.19		225233845.75

Brought Over

Income tax salary

Loan (from A/c no. 8)

Cost of posters

CM Relief Fund

Telemetry Workshop

CZA value of exhibit design

GZA Stud book project

Tropical rainforest workshop

1457.00

281084889.19

Brought Over

1457.00

DG Set

EPABX

AC Plant

Advance for expenses (Trg.)

3500000.00

0.00

IUCN expr. Receivable

Advanced for expd. to staff

190.00

190.00

Loan & advance to staff

500000.00

500000.00

Staff quarters

100000.00

100000.00

Road & culvert

Tennis court

Auditorium

315000.00

Closing stock of steel & cement

Closing balance (Training)

Closing bank balance

F.D.R

Training cost accrued but

not received

1000000.00

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Brought Over	87133023.32	Brought Over	22185831.50	13100730.20	35286561.70
To Pension Fund					
Opening balance		By CZA Course Fee Refund	0.00	0.00	70690.00
FDR	1428880.25	By Refund Security Deposit	0.00	0.00	145680.00
Kisan Vikas Patra	3400000.00	By Festival Advance	0.00	7800.00	7800.00
Receipts during the year					
Income Tax (salary)					
To Loans and Advances to staff					
Computer advance	1450000.00	By Fan Advance	0.00	1700.00	1700.00
Conveyance Advance		By Uniforms	0.00	13560.00	13560.00
To M.Sc course fee		By House Building Advance	0.00	1297905.00	1297905.00
TO MISC. RECEIPTS:					
Guest House Rent	133261.00	By Cycle Advance	0.00	1500.00	1500.00
Cost of lost items	13500.00	By Advance for Exps for Staff	0.00	0.00	1404066.00
Sale of tender	49750.00	By Audit Fee	0.00	26803.00	26803.00
H.L. fee	230889.00	By Landscaping	68878.00	0.00	68878.00
Course fee	6000.00	By Slipend	226020.00	0.00	226020.00
Misc. receipts	529015.51	By Legal Expenses	0.00	26400.00	26400.00
Sale of WiFi Products	125379.75				
Lab Testing Charges	63500.23				
Bus charges	24185.00				
To Steel					
To Cement					
Carried Over	97781642.06	Carried Over	28762263.50	15239063.20	52177265.70
Brought Over	97781642.06	Brought Over	28762263.50	15239063.20	52177265.70
Consultancy Project A/C					
Opening balance	6949017.90	By Photographs & photographic equipment	44886.00	0.00	44886.00
Receipts during the year	8907636.00	By Library books	1067584.00	0.00	1067584.00
Institutional Charges	1431739.65	By Journals & Periodicals	1927171.00	0.00	1927171.00
WINISIS Course Fee	12000.00	By Campus Development	210450.00	0.00	210450.00
International Snow Leopard Trust	118314.00	By Construction of buildings	13418237.00	0.00	13418237.00
Maharashtra Forestry Project	270112.05	By Architectural & Supervision	226860.00	0.00	226860.00
WPA	135542.60	By SAARC payment	422100.00	0.00	422100.00
Illegal Trade Workshop Fee	1500.00	By Earthcare	15000.00	0.00	15000.00
ICIMOD Training Course fee	40800.00				
Capsule Course Fee	117000.00				
GEF Project	258926.00				
MP Bibliography Project	128295.00				
WWF-(Dr. Rajpurohit)	5000.00				
CZA Project (Dr. Arand)	124500				
ICEC Course Fee	3000.00				
Balance of Account No. 34	170850.00				
Loan from account no. 8					
CM Relief Fund	190.00	F.D.R.	0.00	0.00	2802368.84
Zoo course	1722139.00	Bank balance with UBI	0.00	0.00	2802368.84
Kanha Manual Pub.	344397.00	By cash in Bank with UBI	0.00	0.00	2802368.84
EMD forfeited	70000.00	(training a/c)	0.00	0.00	2802368.84
Cancelled cheque in lieu of	169784.00	G.P.F.	0.00	0.00	2802368.84
Publication charges	6000.00	Payment during the year	0.00	0.00	2802368.84
Telemetry workshop	500000.00	Bank balance (closing)	0.00	0.00	2802368.84
CZA value of exhibit design		F.D.R.	0.00	0.00	2802368.84
project	100000.00	Bank balance (closing)	0.00	0.00	2802368.84
CZA stud book	103500.00	F.D.R.	0.00	0.00	2802368.84
Tropical Rain Forest Workshop	315000.00	CONSULTANCY PROJECT A/C:	0.00	0.00	2802368.84
		Payments during the year	0.00	0.00	2802368.84
		Closing balance (bank)	0.00	0.00	2802368.84
TOTAL:	120349045.61	TOTAL:	48916920.34	15239063.20	120349045.61

320590
(S.S. Oberoi)
Finance Officer

(Dr. A.K. GUPTA)
Registrar/Scientist-SG (A)

S. Mukherjee
(S.K.MUKHERJEE)
Director

Wildlife Institute of India
Income and Expenditure Account for the year 2000-2001

EXPENDITURE

EXPENDITURE	Current Year	INCOME	Current Year
To Salaries & Allowances	17843655.00	By Grant - in - aid Ministry of Environment & Forests	57000000.00
To Bonus	229609.00	Less: transfer to capital expr	18568691.29
To Honorarium	17950.00	By Training cost	6392806.00
To Fellowship	1125296.00	By Other Receipt(training)	33145.00
To Wages	445179.00	By Int. on trainee a/c	185188.00
To Travel exps	2684769.00	by Int. on bank deposit	127156.00
To Newspaper & Magazine	29003.00	By Misc. receipts	1175480.41
To Publicity & Adv.	90999.00	By Training cost accrued but not received	153700.00
To Medical	1291620.00	By WII receipts(instt charges)	1431739.60
To Operational Expenditure	6621396.00	By M.Sc course fee	840245.00
To Seminar & Workshop	28602.00	By Consultancy project receipt during the year	8907636.00
To Stationary	875864.00	By Kanha Manual Pub. Fund	342397.00
To Postage & Telegram	132988.00	By EMD forfeited	70000.00
To Sports goods	47758.00	By cancelled cheque of leave salary & pension cont.	169784.00
To Telephone & TC	1019915.50	To Govt. contribution to pension fund	597917.00
To Electricity & Water charges	2103156.20	Leave Salary and Pension contr	44425.00
To Printing & binding	171040.00	To LTC	26803.00
		To Audit fee	

INCOME

INCOME	
17843655.00	By Grant - in - aid Ministry of Environment & Forests
229609.00	Less: transfer to capital expr
17950.00	By Training cost
1125296.00	By Other Receipt(training)
445179.00	By Int. on trainee a/c
2684769.00	by Int. on bank deposit
29003.00	By Misc. receipts
90999.00	By Training cost accrued but not received
291620.00	By WII receipts(instit charges)
1621396.00	By M.Sc course fee
28602.00	By Consultancy project receipt during the year
875864.00	By Kanha Manual Pub. Fund
132988.00	By EMD forfeited
47758.00	By cancelled cheque of leave salary & pension cont.
119915.50	
103156.20	
71040.00	
37917.00	
	34425.00
	26803.00

Current Year

EXPENDITURE	To Salaries & Allowances
To Bonus	
To Honorarium	
To Fellowship	
To Wages	
To Travel exps	
To Newspaper & Magazine	
To Publicity & Adv.	
To Medical	
To Operational Expenditure	
To Seminar & Workshop	
To Stationary	
To Postage & Telegram	
To Sports goods	
To Telephone & TC	
To Electricity & Water charges	
To Printing & binding	
To Govt. contribution to pension fund	
Leave Salary and Pension contr	
To LTC	
To Audit fee	

Brought Over	Brought Over
35632692.70	10544.00
To Conveyance charges	By Publication
To Entertainment charges	By CGEGIS amount lapsed to Govt. a/c
To SAARC Fellowship	By withheld amount lapsed to Govt. a/c
To Stipend	By security deposit more than 3 years to Govt. a/c
To OTA	By cost of posters
To Legal Expr	5497975.00
To Training cost	719895.00
To Repair & maintenance of vehicle	By excess of expenditure over income

Brought Over	35632692.70
To Conveyance charges	10544.00
To Entertainment charges	15904.00
To SAARC Fellowship	422100.00
To Stipend	226020.00
To OTA	416889.00
To Legal Expr	26400.00
To Training cost	5497975.00
To Repair & maintenance of vehicle	719895.00

Brought Over	Brought Over
35632692.70	10544.00
To Conveyance charges	By Publication
To Entertainment charges	By CGEGIS amount lapsed to Govt. a/c
To SAARC Fellowship	By withheld amount lapsed to Govt. a/c
To Stipend	By security deposit more than 3 years to Govt. a/c
To OTA	By cost of posters
To Legal Expr	5497975.00
To Training cost	719895.00
To Repair & maintenance of vehicle	By excess of expenditure over income

64637652.30

TOTAL:

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S.K.MUKHERJEE
Director

K. MUKHERJEE

(Dr.A.K. GUPTA)
Registrar/Scientist-SG (A)

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PERMANENT ASSETS AS ON 31-3-2000

PARTICULARS	OPENING BALANCE	ADDITIONS DURING THE YEAR	TOTAL as on 31-3-2000
Land	6607214.65	0.00	6607214.65
Trees	2432709.00	0.00	2432709.00
Avenue Plantations	2889318.15	288620.00	3177938.15
Campus Development	5375619.31	210450.00	5586069.31
Lab equipment	1404516.07	28431.00	1432947.07
Furniture & Fixtures	8140282.44	163933.00	8304215.44
Vehicle	5626247.21	92663.29	5718910.50
Library books	9977292.28	1067584.00	11044876.28
Office Equipment	5064567.90	-364457.00	4700110.90
Camp Equipment	558771.34	0.00	558771.34
Photographs & Photographic Equipment	2092587.20	44886.00	2137473.20
Materials and supplies	3863727.95	0.00	3863727.95
Educational films	1080432.35	0.00	1080432.35
Journals & Periodicals	14703691.00	1927171.00	16630862.00
Training equipment	22420015.24	1614797.00	24034812.24
Boundary Wall	1446200.59	0.00	1446200.59
Boundary fencing	817934.93	0.00	817934.93
Building complex	106642229.00	12163037.00	118805266.00
Architectural & supervision fee	6626513.85	226860.00	6853373.85
DG Set	715126.00	1255200.00	1970326.00
EPABX	1176484.00	-150484.00	1026000.00
AC Plant	2597452.00	0.00	2597452.00
Staff quarters	3175520.00	0.00	3175520.00
Road & culvert	1724111.00	0.00	1724111.00
Tennis court	530852.32	0.00	530852.32
Auditorium	856592.00	0.00	856592.00
Total:	218546007.78	18568691.29	237114699.07