



Chapter – 1

*Natural
Resources -
Survey
and
Exploration*

Survey of Flora

Botanical Survey of India

Introduction

The Botanical Survey of India (BSI) was established on 13th February, 1890 with the basic objective to explore the plant resources of the country and to identify the plant species with economic virtues. The Headquarter of BSI is located at Kolkata and its 10 circle offices have been set up at various places of the country. It remained quiescent till 1954, when Government of India as a part of scientific development of the country reorganised this department. During the successive plan periods, the functional base of Botanical Survey of India was further expanded to include various new areas such as inventorising endemic, rare and threatened plant species; evolving conservation strategies; studies on fragile ecosystems and protected areas like sanctuaries, national parks and biosphere reserves; monitoring of changes in floristic components; conservation; multiplication and maintenance of germplasm of plant genetic resources, endemic and threatened species, wild ornamentals etc., in Botanic Gardens and Orchidaria; ethnobotanical and geobotanical studies and development of National Database on Herbarium (including type specimens) and live collections, plant genetic resources, plant distribution and nomenclature.

Objectives

Primary and Secondary objectives of BSI are as follows

Primary

- Exploration, inventorisation and documentation of phytodiversity in general and protected areas, hotspots, fragile ecosystems and sacred groves in particular; publication of National, State and District Floras.
- Monitoring Phytodiversity to evaluate the qualitative changes in species rich and

sensitive areas; ex situ conservation of critically threatened taxa in botanical gardens.

- Identification of species with traditional economic uses and preparation of protocols for their conservation and sustainable utilization.
- To complete a National database of plant species, herbarium specimens, live specimens, illustrations, relatives of cultivated species and economically important species.

Secondary

- Survey, Inventorisation and documentation of non-flowering plants.
- Monographic studies on selected plant groups.
- Qualitative and quantitative study of the diversity of selected economically useful species.
- Capacity building in plant taxonomy through refresher courses and post M.Sc., certificate course.
- Environment Impact Assessment of areas assigned to BSI for study.
- Develop and maintain botanical gardens, musea and herbaria.
- Preparation of Pollen Atlas of Indian Plants.

Activities undertaken during the year

Botanical Exploration and Inventorisation of Phytodiversity

Field tours and Herbarium consultation tours

- Thirty-eight field/exploration/live plant collection/EIA Study tours were undertaken by different circle offices and units of BSI covering several districts of Arunachal Pradesh, Chukrasila & Burachapori Wildlife Sanctuary of Assam, Dzuko Valley Wildlife Sanctuary of Nagaland, Dampa Wildlife Sanctuary of Mizoram, East and West Khasi Hills of Meghalaya, Catchment Area of Tsango



Fig.1 *Gloriosa superba* - an ornamental orchid of Himalaya

Lake, Khechepelori Lake & Meimanchu Lake and several other districts of Sikkim (including Namchi), Bakhira Birds Sanctuary, Sant Kabir Nagar of Uttar Pradesh, Manipuri, Etawah, Etah, Agra & Kanpur Districts of Uttar Pradesh, National Capital Territory of Delhi & its environ, Cold Desert areas of North Western Himalayas (including Leh & Pin Valley), Banganga Wetland of Haridwar district of Uttarakhand, Sabarkantha (Himmatnagar) & Amreli districts of Gujarat, Mookambika Wildlife Sanctuary of Karnataka, Javadi hills of Tamil Nadu, Mangrove area of Kerala, Ferrargunj & Madhuvan forest areas of South Andaman, Keonjhar & Sundergarh districts of Orissa, Mahananda Wildlife Sanctuary, Jalpaiguri, Maldah, Howrah & North 24 Parganas (including East Kolkata Wetlands-Ramsar Site) districts of West Bengal.

- During the field/ exploration/ collection tours, more than 5,500 specimens were

collected including lower groups of plants viz. Algae, Fungi, Lichens, Bryophytes and Pteridophytes. About 3,000 specimens belonging to 900 species were identified by different circles and units of Botanical Survey of India.

- Ten herbarium consultation tours/study tours were undertaken to BSD (BSI – Northern Circle, Dehradun), DD (Forest Research Institute, Dehradun), CAL (Central National Herbarium – Howrah), ASSAM (BSI – Eastern Circle, Shillong), BLAT (Blatter Herbarium, Mumbai), MH (BSI – Southern Circle, Coimbatore), S. P. University – Vallavidyanagar – Gujarat, Allahabad University – Allahabad and Banaras Hindu University – Varanasi in connection with the following revisionary and floristic studies under National/State/Region/District flora.
 - Flora of Gujarat State, Volume I
 - Flora of Tawang District, Arunachal Pradesh

- Flora of Sikkim, Volume II
- Monocot Flora of Dibang Valley, Arunachal Pradesh
- Flora of Upper Subansiri District, Arunachal Pradesh
- Fresh Water Algal Flora of Howrah District, West Bengal
- Floristic Assessment of Chukrasila, Bura Chapori and Dzuko Valley Wildlife Sanctuaries
- Flora of India: Orchidaceae (Genera: Oberonia, Microstylis, Liparis, Oreorchis & Corallorrhiza)

Documentation of Phytodiversity

National Flora (Flora of India)

- Polygonaceae: Completed the checklist of 180 species. Detailed taxonomic descriptions of all genera except Polygonum were completed.
- Orchidaceae (Genera – Oberonia, Microstylis, Liparis, Oreorchis & Corallorrhiza): Finalisation of description and illustrations were completed for 35 species of Liparis and 20 species of Oberonia.
- Cyperaceae (Genera : Kyllinga – 12 spp., Pycnus – 29 spp., Mariscus – 21 spp. & Courtoisina – 1 species): Prepared descriptions & key to seven species, one subspecies and one variety of Kyllinga, corrected the identity of ca. 50 specimens under the genus Kyllinga and nomenclature updated.
- Revision of Thymelaeaceae (13 genera, 27 species): Studies completed.
- Revision of Loganiaceae (7 genera, 27 species): Completed and manuscript prepared.
- Acanthaceae (6 genera, 50 species): Completed taxonomic description and drawing of 1 species of Lepidagathis and 14 species of Dicliptera.



Fig.2 A pride of North-Eastern Himalayas

- Lauraceae: Completed taxonomic description and habit sketch of 10 species of *Alseodaphne* and *Cinnamomum*.
- Genus *Rubus* (Rubiaceae): Completed taxonomic description of 30 species.

Regional Flora

- Pteridophytic Flora of Western Himalaya (ca. 47 families, 95 genera & 400 species): Taxonomic description of 33 species completed.
- Aphyllorales of North Western Himalaya (ca. 23 families, 207 genera & 1000 species): Taxonomic description of 27 species completed.
- Digital Flora of National Capital Territory (Delhi & Environs): Prepared the checklist by including habit, phenology and occurrence of plants.



Fig.3 *Nepenthes khasiana* – commonly known as pitcher plant

State Flora

- Flora of Mizoram Volume II: Manuscript submitted
- Flora of Mizoram Volume III: Checklist of Monocots of Mizoram is being prepared.
- Flora of Sikkim (Rosaceae – 110 species, Orchidaceae – 500 species and Rubiaceae – 88 species) Taxonomic description of 43 species of Rosaceae, 67 species of Orchidaceae and 88 species of Rubiaceae were completed.
- Flora of Uttar Pradesh Volume I: 124 species of family Mimosaceae completed. Generic Key of Mimosaceae and specific key for genera *Acacia* and *Mimosa* completed
- Flora of Uttar Pradesh, Volume II:
 - ▲ Cornaceae – Rubiaceae (71 species), Acanthaceae (75 species): Taxonomic description of 26 species completed.
 - ▲ Campanulaceae – Apocynaceae (67 species), Scrophulariaceae (70 species), Pedaliaceae – Myrtaceae (3 species): Taxonomic description of 63 species were completed.
 - ▲ Asclepiadaceae – Boraginaceae (57 species), Lamiaceae (64 species), Amaranthaceae (30 species): Taxonomic description of 23 species of Amaranthaceous were completed.
 - ▲ Orobanchaceae, Gesneriaceae, Lentibulariaceae (12 species), Verbenaceae (38 species), Chenopodiaceae – Santalaceae (52 species), Urticaceae (18 species): Taxonomic description of 73 species of family Verbrnaceae, Chenopodiaceae and Urticaceae were completed.
- Flora of Jammu & Kashmir, Volume III
 - ▲ Myrsinaceae (3 genera 3 spp.), Styracaceae (1 genus 1 spp.), Ebenaceae (1 genus 3 spp.), Oleaceae (6 genera 22 spp.), Apocynaceae (10 genera 10 spp.): Mss. of 34 spp. were finalised.



Fig.4 A glorious ornamental flower

- ▲ Gnetianaceae (10 genera 34 species), Asclepiadaceae (15 genera 25 species), Loganiaceae (2 Genera 2 species): Manuscript of 71 species were finalised.
 - Flora of Gujarat, Volume I:
 - ▲ Key to the genera and species for 64 species belonging to the family Fabaceae and Caesalpiaceae were prepared.
 - ▲ Key to the genera and species for 178 species belonging to the families Mimosaceae, Tiliaceae, Zygophyllaceae, Geraniaceae, AVerrhoaceae, Celastraceae and Moringaceae were prepared.
 - ▲ Key to the genera and species for 79 species belonging to family Rosaceae, Onagraceae, Combretaceae, Myrtaceae, Alangiaceae, Molluginaceae, Lythraceae, Haloragaceae, Rhizoporaceae and Apiaceae were prepared.
- Flora of Kerala, Volume II
 - ▲ Rubiaceae (ca 240 taxa): Taxonomic description of 70 species completed.
 - ▲ Taxonomic description of Nyctaginaceae and chenopodiaceae were completed
 - ▲ Asclepiadaceae (ca 80 taxa): Taxonomic description of 45 spp. belonging 15 genera were completed.
 - ▲ Hernandiaceae – Buxaceae (65 genera and 184 taxa): Completed taxonomic description along with keys of 17 species under 8 genera belonging to 2 families.
 - ▲ Convolvulaceae (ca 80 taxa): Taxonomic description of 8 species were completed.
 - ▲ Ulmaceae – Moraceae (ca 46 taxa): Taxonomic description of 20 species were completed.
 - ▲ Boraginaceae (ca 17 taxa): Taxonomic description of 17 species were completed.

- Flora of Andaman & Nicobar Islands, Volumell
 - ▲ Loganiaceae (3 genera 9 species): Completed writing of manuscript.
 - ▲ Manuscript of the families Aclepiadaceae, Nyctaginaceae, Aristolochiaceae, Piperaceae, Chloranthaceae, Monimiaceae and Lamiaceae were completed.
- Flora of West Bengal, Vol. III (ca 736 spp.): Editing of families Ebenaceae, Araliaceae, Apocynaceae, Asclepiadaceae, Hydrophyllaceae & Boraginaceae were completed.
- Flora of West Bengal, Vol. IV (ca 736 species): Editorial checking of families Balanophoraceae, Myristicaceae, Salicaceae and Euphorbiaceae had been completed. Taxonomic description of 2 species of Lamiaceae, 6 species of Verbenaceae and 16 species of Loranthaceae have also been completed.
- Flora of West Bengal, Volume V: Completed taxonomic description of 4 species of Potamogetonaceae, 2 species of Hydrocharitaceae & 33 species of Poaceae.
- Pteridophytic Flora of West Bengal: Manuscript of 54 families belonging to 116 genera and 416 species was completed.
- Endemic Pteridophytes of West Bengal: Prepared. RET list and 64 line drawings prepared.

District Flora/Garden Flora

- Moss Flora of Tawang District, Arunachal Pradesh: 965 specimens out of 1028 collected specimens were identified so far.
- Flora of Barapani Garden, Shillong: Work

completed; manuscript includes 156 families, 407 genera & 676 species.

Documentation of Indigenous Knowledge of Plant Resources

- Ethnobotanical study of Orissa: Conducted one tour to Sundergarh district and one tour to Keonjhar district and collected 253 plant specimens having medicinal/food/fodder value.
- Plants used in Cosmetics in India: 60 species (up-to-date nomenclature, distribution, photographs, uses etc.) have been prepared.
- Vernacular names, botanical names and local uses of 350 species used by five tribes of Arunachal Pradesh were



Fig.5 A red star glory (*Ipomoea hederifolia*)

Ex-Situ Conservation:

Botanic Garden, BSI, Southern Circle, Yercaud

Targets	Achievements
Collection, introduction, multiplication of rare, endangered and economically important plants.	Conducted one tour to Javadi Hills, Tamil Nadu and collected 54 orchids and 19 Garden plants. Multiplied 17 rare orchids and 117 ornamental orchids. Transplanted 27 rare orchids and 22 ornamental orchids. Introduced 34 new plants in Experimental Botanic Garden.
Micropropagation of rare, endangered and threatened plants.	Asymbiotic germination of three orchid taxa viz <i>Paphiopedilum spicerianum</i> (Reichb.f.) Pfitz., <i>P. villosum</i> (L.)Stein, and <i>Aerides maculosum</i> Lindl.. Result: Seeds were developed into protocorm like bodies after culturing. Micropropagation of <i>Bentinckia condapanna</i> Berry ex Roxb: Out of 50 seeds sown, 15 seeds are germinated. The seedlings are used for further experiment. In <i>Dendrobium aquem</i> , the explants like leaves shoot tips stem segments and roots were tried. Of which, leaves and roots shown good result. Protoplast Isolation: The protoplasts were successfully isolated from both leaves & petals from <i>Paphiopedilum villosum</i> (L.) Stein. Isolation of mycorrhiza was done from the <i>Paphiopedilum villosum</i> (L.) Stein and <i>Phaius tancervilliae</i> (Banks ex L'Herit) Blume for the symbiotic germination studies. The isolated pure fungal cultures were maintained for symbiotic germination of terrestrial orchids.

Botanic Garden, BSI – Eastern Circle, Barapani, Shillong

Targets	Achievements
Ex-situ conservation, multiplication of Rare, endangered and economically important plants to be multiplied and conserved in the Botanic Garden, Barapani & National Orchidarium, Shillong	Maintenance, introduction & propagation work is continued. 210 seedlings of <i>Michelia doltsopa</i> , <i>M. oblonga</i> , <i>Exbucklandia populnea</i> , <i>Pongomia pinnata</i> , <i>Jacaranda mimosifolia</i> , <i>Anthocephalus cadampa</i> , <i>Grevillea robusta</i> , etc. planted at Botanic Garden, Barapani on 5th June, 2007 on the occasion of World Environment Day. 150 seedlings belonging to 5 genera and species transplanted to different parts of Botanic Garden, Barapani Raised 1500 seedlings belonging to 11 genera & species in the Nursery Introduced 41 genera and species collected from different parts of NE India. 1500 Seedlings of <i>Taxus baccata</i> raised <i>Nymphaea tetragona</i> collected from natural habitat and introduced at BSI, Eastern Circle, Shillong.

The Indian Botanic Garden, Howrah, Botanic Garden of Indian Republic, NOIDA and other Botanic Gardens of BSI are conserving RET species, Medicinal/Economically important plant species and

wild ornamental species. Cuttings of 86 species were planted and seeds of 12 species were sown in the Mist Chamber of Indian Botanic Garden, Howrah.

Chemical/Pharmacognostic Studies on Indian Flora

Name of the Project	Details of activities
Isolation of flavanoids from Bauhinia plants and its contribution to the chemotaxonomy of the family Leguminosae	Phytochemical screening of the seeds of Bauhinia malabarica reveals 10.58% moisture (by weight) and 2.75% gum (by weight) and the presence of flavonoids in the ethanol extract of the seeds. Isolation of flavonoids by column chromatography is under process.
Phytochemical investigations of Endangered Plant species in India included Negative List of Export	Literature survey of the plants of negative list of Export with special reference to their chemical and biological activities has been completed. Conducted tours to Tawang of Arunachal Pradesh and Gangtok of Sikkim and collected materials of Swertia chirayita, Dactylorhiza hatagirea and Picrorhiza kurroa. Isolation and characterization of active constituents from Pterocarpus santalinus is under progress.
Pharmacognostic Studies on the selected plants of the Negative list of Export	Collected part of literature and related data on five plant species that are included in the Negative List of Export viz. Swertia chirayita, Dactylorhiza hatagirea, Renanthera imschootiana, Panax pseudo-ginseng and Podophyllum hexandrum. The herbarium specimens of the above five Negative list of plants were consulted at herbarium in Sikkim Himalayan Circle (BSHC), Gangtok and the available information was noted down for further studies. Field tours were undertaken to different parts of Sikkim and Arunachal Pradesh and collected the aforesaid plants/plant parts for pharmacognostic studies. The coarsely powdered floral parts of Renanthera imschootiana and roots/rhizomes of Dactylorhiza hatagirea were studied. The macro-morphological features and organoleptic characters of rhizomes of Dactylorhiza hatagirea and Panax pseudo-ginseng were studied.



Fig.6 *Dendrobium lindloyi*- a rare flowering species

Publications

Research Based Publication

No. of papers and abstract published		No. of papers & abstracts accepted/communicated		Number of books published			No. of articles published		
Indian Journal	Foreign Journal	Indian Journal	Foreign Journal	Hindi	Eng-lish	Regional Language	Hindi	Eng-lish	Regional Language
91	26	69	10	01	04	-	11	04	03

Besides, two priced publications, one unpriced publication and two journals/bulletin were also published during the year.

Public Services Rendered: BSI is engaged in disseminating scientific knowledge to public and also assisting scientists, students and researchers in their pursuit of Plant Knowledge. During the period 35,000 scientists, students and visitors and more than 25 VIPs visited the Botanic Gardens, Herbaria and Museums of BSI throughout India. About 125 queries on distribution and

uses of plants and plant materials had been supplied to them. BSI has identified 355 plant materials and supplied 1300 pages photocopied literature on payment basis during the year.

Library

536 Indian Journals, 459 Foreign Journals, 29 Departmental & 378 Other Institutional Reports/Newsletters/Brochures and 859 books have been incorporated in the libraries of BSI Headquarters and its circle offices.

Databases

BSI and its various circles/units developed databases as follows

Circle/Unit	Details of Database job done	
Industrial Section, Indian Museum, Kolkata Botanic Garden of Indian Republic, NOIDA	Database of Exhibits/Specimens in different bays in Botanical Gallery developed: <ul style="list-style-type: none"> • Preparation of database on Fibre Bay • Preparation of database on Medicinal plant Bay • Preparation of database on Dyes, resins and tannins Bay • Preparation of database on Food, Fodder & Beverage Bay • Preparation of database on Oil & Oilseeds Bay 	
Botanic Garden of Indian Republic, NOIDA	Database of trees of India	Data pertaining to the correct name, synonyms, phenology, distribution, brief description, conservation measures, occurrence status of 245 indigenous tree species was collected.
	Bibliographic Databases	Data entry of 1500 bibliographic references completed.
	Data of introduced plant	Compiled data of about 80 indigenous species introduced in BGIR garden maintained in database
	Database of Indian Pteridophytes	Database structure finalised and is ready for use. Data collected for genus Lepisorus. Data entry sheets of Helypteridaceae finalised and incorporated in the database.
Central National Herbarium, Howrah	2759 Data sheets of 8 families have been prepared	

Maintenance of Herbaria in Botanical Survey of India

No. of Specimens mounted (Lower & Higher Groups)	986
No. of Specimens remounted	5142
No. of Herbarium sheets Stitched/labeled	9234
No. of Herbarium sheets dusted/fumigated	18025
No. of specimens poisoned	11024
No. of Genus cover/species cover changed	2857
No. of Specimens incorporated	4586
No. of Specimens sent on loan	112
No. of Specimens received on exchange/loan	221
No. of cibachromes received from Kew	45 (Incl. 6 Holotypes, 2 Isotypes, 3 Isosyntypes)
No. specimens received on gifts	254
No. of species identified	4125
No. of Herbarium sheets accessioned	3587

Other Activities

- Project for Conservation, Restoration and Digitization of the Old Archival Documents/Correspondence/Manuscripts and herbarium Specimens at Industrial Section under e-Governance project of the Ministry.
- Project for setting up of an Indian Virtual Herbarium (IVH), one Digital Herbarium (DH), and two Data Production Lines (DPL) at BSI.
- Project for Conservation, Restoration and Digitization of the Historic Forbes Watson and Thomas Wardle Volumes on Textiles and Natural Dyes at Industrial Section of BSI, Kolkata under e-Governance project of the Ministry.
- The book on "Plants on the Indian Botanic Garden Howrah" fully illustrated was released during November, 2007.
- Website of Botanical Survey of India was launched during November, 2007. The website can be viewed at <http://www.bsi.gov.in>.
- BSI also organized various activities on the occasion of World Environment Day, Earth Day and celebrated Vanomahotsav.



Fig.7 *Brainea insignis* – endemic to Meghalaya and Western Ghats

- As a part of the educational programme, BSI organized Drawing Competition, Tree Plantation, Slogan Writing Competition for school children at Botanic Garden of the Indian Republic, NOIDA culminating in celebration of National Science Day.
- Training Programme on e-Granthalaya was organized for librarians of BSI and ZSI. It is proposed to network libraries of the Circle Offices/Regional Stations of BSI and ZSI respectively.



Fig.8 *Eriolaena hookeriana* – pride of the Indian flora

Special information

Details of 11 New Species/Variety Discovered during the year

- *Eria nongstoiana* Phukan & Rabha [Orchidaceae]
- *Dendrobium meghalayense* Chaya Deori et. al. [Orchidaceae]
- *Juncus bengalensis* var. *Kyannoslae* Chhetri, G., T. M. Hynniewta & A. A. Ansari [Juncaceae]
- *Morus macrura* L. var. *bracteata* Upadhyay & Ansari [Moraceae]
- *Dasya ulhasii* Sonali Jadiye & P.S.N. Rao [Dasyaceae]
- *Phyllanthus rangachariarii* Murugan et. al. [Euphorbiaceae]
- *Psychotira henryana* Murugan & Gopalan [Rubiaceae]
- *Tripogon borii* K. A. A. Kabeer, V. J. Nair & G. V. S. Murthy [Poaceae]
- *Trachys copeaana* K. A. A. Kabeer, V. J. Nair [Poaceae]
- *Polypogon nilagiricus* K. A. A. Kabeer, V. J. Nair [Poaceae]
- *Stellaria pinvalliaca* K. Chandra Sekar & S. K. Srivast. [Caryophyllaceae]

Sixteen New Records for India

- *Colubria* R. Br. [Rosaceae]
- *Cleisostoma duplicilobum* (J. J. Sm.) Garay [Orchidaceae]
- *Dendrobium sociale* J. J. Sm. [Orchidaceae]
- *Juncus harae* Miyam. et Ohba [Juncaceae]
- *Juncus sherei* Miyam. et Ohba [Juncaceae]
- *Iris proantha* Diels [Iridaceae]
- *Luisia secunda* Seidenf. [Orchidaceae]
- *Boletus reticulates* (Zang.) Sharma [Boletaceae] – Fingi
- *Boletopsis leucomelaena* (Pers.) Fayod [Polyporaceae] – Fungi
- *Cyanthillum hookerianum* (Arn.) H. Rob. [Asteraceae]
- *Pavetta badullensis* Ridsd. [Rubiaceae]
- *Vernonia wightiana* Arn. [Asteraceae]
- *Vernonia pectiniformis* DC. Subsp. *puncticulata* (DC.) Grierson [Asteraceae]
- *Panicum plenum* Hitch. & Chase [Poaceae]
- *Ehrharta stipoides* Labill. [Poaceae]
- *Combretum tetragonocarpum* Kurz. var. *tetralophum* (C. B. Clarke) Gang. & T. Chakrab. [Combretaceae]

Eight New Records for States

- *Sebastiania Sprengel* [Euphorbiaceae] – a new generic report for Andaman Islands
- *Acampe rigida* (Buch. – Ham ex J. E. Smith) P. F. Hunt [Orchidaceae] – Andaman Islands
- *Taxocarpus kleinii* Wight & Arn. [Asclepiadaceae] – Andaman Islands
- *Pavetta siphonannanthai* Dalz. [Rubiaceae] – Tamil Nadu
- *Pavetta travancorica* Bremek. [Rubiaceae] – Tamil Nadu
- *Tarenna trichurrensis* N. Saidh. & Sivar. [Rubiaceae] – Tamil Nadu
- *Ventilago denticulata* Willd. Var. *bifida* Bhandari [Rhamnaceae] – Andhra Pradesh
- *Senna uniflora* (Mill.) Irwin & Barenj [Caesalpiniaceae] – Andhra Pradesh

Four species collected after 50 years or more

- *Begonia adscendens* C. B. Clarke – recollected after 100 years
- *Korthalsia rogersii* Becc. [Arecaceae] – recollected after 90 years from South Andaman islands
- *Begonia arborensis* Dunn. [Begoniaceae] – rediscovered after 50 years
- *Ctenopteris subfalcata* Blume ex Kunze [Grammitidaceae] – a Pteridophyte rediscovered after 50 years

Survey of Fauna

Zoological Survey of India

Introduction and Objectives

The Zoological Survey of India (ZSI), a premier institute under the Ministry, has been undertaking survey, exploration and research leading to the advancement of our knowledge on the exceptionally rich faunal diversity of the country since its inception in 1916, with its headquarters at Kolkata and 16 Regional Stations located in different parts of the country, ZSI in recent years, has reoriented its plan of work by grouping the survey and studies under six major programmes viz.

- Fauna of States,
- Fauna of Conservation Areas,
- Fauna of Important Ecosystems,
- Status Survey of endangered species and
- Ecological Studies/Environment Impact Assessment Survey
- Identification of Wildlife Seized materials related to Wildlife (Protection) Act, 1972.

Besides these, the ongoing Fauna of India program was also continued.

- One hundred and one extensive faunal surveys were undertaken to different States/Union Territories including important ecosystems and some selected conservation/ protected areas. Five status

surveys were carried out. One Environment Impact Assessment survey at Rowghat of Bhilai Steel Plant in Orissa was carried out. Besides, several short duration intensive surveys for ecological studies were also undertaken. Detailed taxonomic studies were carried out on the material collected during these as well as earlier surveys. Ecological studies including status survey of endangered animals were continued during the year.

- The National Zoological Collection was further enriched by the addition of 13016 Identified specimens belonging to 1165 species. In addition to above major activities, Identification and Advisory Services were rendered to 96 individuals or institutions in India and abroad. The training courses were organised under Training and Extension Programme. The Z.S.I. scientists also participated in the training courses like e-Granthalaya and meetings abroad.
- Publications brought out during the year includes 2 volumes (8 parts) of the periodical Records of Zoological Survey of India, 10 occasional papers, two volumes of Memoirs of Z.S.I., Two documents on the Fauna of Conservation Areas, one document on fauna of Wetland Ecosystem, three volumes on State Fauna, two volumes on Bibliography of Indian Zoology, three documents of Handbooks and Pictorial Guides and four special publications.

Activities undertaken during the year under various programmes

Faunal Explorations and Surveys

Ecosystems

Wetlands

A total of fourteen extensive surveys undertaken, five in Himachal Pradesh, (three to Govind Sagar, two to Pong Dam), two surveys each to Bhoj Wetland in Madhya Pradesh and Hooghly River in West Bengal and one survey each to Flood-plain lakes (Assam), Chauri of Ganges River in North Bihar, Asan barrage in Uttaranchal State, Nal-Sarovar and Khijaria lake in Gujarat.

Deserts

Three extensive faunal explorations (two to Thar Desert of Rajasthan and one to Cold Desert of Ladakh in Jammu & Kashmir) were carried out.

Estuarine/Riverine

Four extensive faunal surveys, one each in Bahuda estuary (Orissa), Vamsadhara Nagavali Estuary (Andhra Pradesh), Beas river (Himachal Pradesh) and rivers of Kerala were carried out.

Coastal/Marine

Three extensive surveys in Shoreline habitats of southern Orissa Coast were carried out.

Conservation Areas

Biosphere Reserves

One survey to Achanakmar in Chhattisgarh State was carried out.

National Parks

A total of eight surveys, one to Bandhavgarh in Madhya Pradesh, one to Bannerghata in Karnataka, one to Dibru-Saikhowa in Assam, one to Kangerghati in Chattisgarh, one to Kudremukh in Karnataka, two to Pench in Maharashtra and one to Ranthambhore in Rajasthan were carried out.



Fig.9 Snow leopard - an endangered alpine fauna

Wildlife Sanctuaries

A total of 14 faunal explorations, two to Baghmara in Meghalaya, three to Bhimshankar and two to Lonar Crater in Maharashtra, one to Kumbhalgarh and one to Talchapar in Rajasthan, four to Simbalbara in Himachal Pradesh and one to Pabitora in Assam were carried out.

Tiger Reserves

Three surveys, one to Bhadra in Karnataka, one to Corbett in Uttaranchal and two to Sariska in Rajasthan were carried out.

States and Union Territories

Under this programme, 44 surveys were conducted in several districts of Andhra Pradesh, Arunachal Pradesh, Assam, Goa, Gujarat, Himachal Pradesh, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Mizoram, Nagaland, Rajasthan, Tamil Nadu, Tripura and Uttaranchal.

Ecological/Status Survey

Five status surveys one for Tibetan Wild Ass (Kiang) in Ladakh, one for Himalayan Marmot in Ladakh, one for Snow Trout in Himachal Pradesh, one for Gangetic Dolphin in Hooghly River of West Bengal and another for Himalayan Salamander in northern West Bengal were carried out.

E.I.A. Survey

One rapid survey of Rowghat of Bhilai Steel Plant in Orissa was carried out.

Research work

Identification of New Taxa

During the period January 2006 to October 2007, the scientists of the ZSI described six species as new to Science. (Three species of Amphibia, three species of Insects)

Taxonomic Studies

The research work carried out on the fauna collected from different states, conservation areas and other ecosystems are as follows:-

Fauna of India

No volumes were published during the period under report.

Fauna of States

Andhra Pradesh

One hundred and ten specimens belonging to 26 species of Orthoptera and six specimens belonging to three species of Reptilia were studied and identified.

Arunachal Pradesh

Taxonomic studies on the fauna of this State resulted in collection of 122 specimens belonging to 12 species of fresh-water fishes.

Assam

One hundred and sixty nine specimens belonging to 62 species of Crustacea, 166 specimens belonging to 78 species of Fishes and 73 specimens belonging to 26 species of Amphibia were identified.

Goa

One hundred and two specimens belonging to 30 species of Crustacea, 197 specimens belonging to 19 species of marine mollusca and 9 specimens belonging to 7 species of Mantodea were identified.

Gujarat

One hundred and forty three specimens belonging to 38 species of Coleoptera were identified.

Himachal Pradesh

One specimen pertaining to one species of Mammal, eight specimens belonging to six species of Reptilia, 12 specimens belonging to two species of Fishes and four specimens belonging to two species of Lepidoptera were identified.

Karnataka

Four hundred and eighty four specimens belonging to 48 species of Fishes and 59 specimens belonging to 17 species of Reptiles, 86 specimens belonging to 39 species of Odonata, 214 specimens belonging to 24 species of marine molluscs and 54 specimens belonging to nine species of Hemiptera were studied and identified.

Kerala

Three specimens comprising two species of Mammals, 11 specimens elonging to five species of Reptiles, 59 specimens belonging to 16 species of Amphibia, 543 specimens comprising 96 species of Fishes and 51 examples belonging to 19 species of Odonata were identified.

Madhya Pradesh

Fortyfour specimens belonging to 17 species of Odonata, 15 specimens comprising six species of Crustacea, 15 examples belonging to three species of Ostracoda, 119 specimens comprising 23 species of Arachnida, 19 examples belonging to 9 species of Hemiptera and two specimens belonging to one species of Chilopoda were identified.

Maharashtra

Twenty six specimens belonging to six species of Mammals, 262 specimens comprising 69 species of Fishes, 174 specimens belonging to 37 species of Molluscs, 371 specimens comprising 27 species of Arachnida, 63 specimens belonging to 12 species of Thrips and 136 specimens belonging to 25 species of Thysanoptera were identified.



Fig.10 Rhinos in its natural habitat

Manipur

Six hundred and six specimens comprising of 27 species of Fishes, 441 specimens comprising of 24 species of Amphibia, 30 specimens belonging to 13 species of Crustacea and 19 specimens belonging to 12 species of Molluscs were identified.

Meghalaya

Five hundred and eighty five specimens comprising of 57 species of Fishes, 176 specimens comprising of 31 species of Amphibia, 18 specimens belonging to 14 species of Reptiles, 137 specimens belonging to 74 species of Lepidoptera, 16 examples belonging to one species of Arachnida and 12 examples belonging to 7 species of aquatic Hemiptera were identified.

Mizoram

Forty eight specimens belonging to 11 species of Amphibia, seven specimens belonging to five species of Reptiles and 162 specimens comprising 35 species of Fishes were identified.

Nagaland

Four hundred sixty nine specimens comprising of 67 species of Fishes and 55 specimens belonging to 19 species of Reptiles were identified.

Rajasthan

Two hundred and sixty two specimens belonging to 84 species of Nematodes, 106 specimens belonging to 28 species of Isoptera, 82 specimens comprising of 16 species of Hymenoptera, 147 specimens comprising 33 species of Coleoptera and 12 specimens belonging to four species of fresh-water fishes were identified.

Tamil Nadu

One hundred forty two specimens comprising of 14 species of Fishes, 28 specimens belonging to four species of Crustacea, 95 specimens belonging to 15 species of Mollusca and 47 specimens comprising of 22 species of Mantodea were identified.



Fig.11 *Ketupa zeylonensis* – commonly known as Brown fish-owl

Tripura

One hundred and twenty six specimens comprising of nine species of Amphibia were recognized.

Uttaranchal

Forty six specimens belonging to 18 species of Lepidoptera, 13 examples belonging to three species of Platyhelminthes, 13 specimens belonging to five species of Amphibia, 16 specimens belonging to six species of Fishes and three specimens belonging to one species of Reptile were identified.

Fauna of Conservation Areas

Biosphere Reserves

Achanakmar (Chattisgarh)

Fifteen specimens belonging to 11 species of Coleoptera (Family: Scarabaeidae) were studied and determined.

National Parks

Bandhavgarh (Madhya Pradesh)

Twenty three specimens longing to six species

of Arachnida and 109 specimens comprising 32 species of Lepidoptera were studied and determined.

Bannerghata (Karnataka)

Four hundred sixty eight specimens pertaining to 12 species of Hemiptera and 14 specimens belonging to seven species of Reptilia were studied and identified.

Dibru-Saikowa (Assam)

Twenty one specimens comprising 12 species of Crustacea were studied and recognised.

Kangerghati (Chhattisgarh)

As a result of studies conducted on the fauna of this park, 126 specimens comprising 39 species of Lepidoptera, 26 specimens pertaining to 8 species of Coleoptera and 26 examples belonging to two species of Plant Mites were determined.

Kudremukh (Karnataka)

Eighty six specimens belonging to 12 species of Fishes, 34 specimens belonging to eight species of Amphibia and 30 specimens belonging to 14 species of Odonata were studied and recognised.

Pench (Maharashtra)

Twenty one specimens belonging to four species of Thysanoptera were studied and identified.

Ranthambhore (Rajasthan)

One hundred thirteen specimens comprising 28 species of Coleoptera (Family: Scarabaeidae) were studied and recognised.

Wildlife Sanctuaries

Baghmara (Meghalaya)

As a result of studies carried out in this sanctuary 376 specimens belonging to 24 species of Fishes were identified.

Bhimsankar (Maharashtra)

Twenty specimens pertaining to seven species of Chilopoda, 32 specimens belonging to 15



Fig.12 Rigorous conservation required for Red Panda – an endangered species
species of Mollusca, 124 specimens belonging to eight species of Arachnida, two specimens belonging to one species of Odonata, 53 specimens belonging to nine species of Crustacea and 96 specimens belonging to six species Fishes were studied and determined.

Churdhar (Himachal Pradesh)

Twenty one species of Birds, three species of Mammals and three species of Reptiles were

studied and identified.

Khijadiya (Rajasthan)

Eighty nine species of Birds, six species of Mammals and four species of Reptiles were identified.

Kumbhalgarh (Rajasthan)

Three hundred fifteen specimens belonging to 28 species of Coleoptera, 38 examples belonging to 14 species of Nematodes, 19 specimens belonging to five species of Arachnida, three specimens belonging to two species of Myriapoda and 47 specimens belonging to four species of Molluscs were identified.

Lonar Crater (Maharashtra)

thirteen specimens belonging to six species of Mammals, 37 specimens comprising 11 species of Mollusca, 30 specimens belonging to 11 species of Odonata and two specimens belonging to two species of Crustacea were determined.

Pabitora (Assam)



Fig.13 Gangotri – an endangered species

As a result of studies conducted on the zooplankton diversity of seven perineal and ephemeral flood plain lakes of this sanctuary, 27 specimens of Rotifera belonging to 16 species were recognised.

Simbalwara (Himachal Pradesh)

Fifteen specimens belonging to 12 species of Reptilia, one specimen belonging to one species of Mammal, 56 specimens belonging to 14 species of Amphibia, 80 specimens belonging to 22 species of Fishes, 48 specimens belonging to 25 species of Lepidoptera, 44 specimens belonging to 13 species of Orthoptera and 132 specimens belonging to 32 species of Annelida were identified.

Talchhapar (Rajasthan)

The taxonomic investigation recorded on the fauna of this sanctuary includes 24 specimens comprising nine species of Coleoptera and 11 specimens consisting of four species of Arachnida.

Tiger Reserves

Bhadra (Karnataka)

Twenty nine examples belonging to 10 species of Fishes, seven examples belonging to two species of Amphibians and 11 examples belonging to eight species of Odonata were identified.

Corbett (Uttar Pradesh)



Fig.14 *Panthera tigris* – now requires rigorous protection and conservation

Thirty two specimens belonging to 17 species of Odonata were identified.

Sariska (Rajasthan)

Three species of Mammals and 72 species of Birds were observed. 14 specimens belonging to three species of Reptilia, 296 specimens belonging to 33 species of Coleoptera, 16 specimens belonging to two species of Hymenoptera and 32 specimens belonging to seven species of Nematodes were recognized.

Fauna of Important Ecosystems

Fresh water Wetlands

Asan Barrage, Uttaranchal

Fifty two species of Avifauna were recorded.

Bhoj, Madhya Pradesh

Fifty six specimens belonging to 10 species of Cladocera (Crustacea) and 40 specimens belonging to six species of Ostracoda (Crustacea) were studied and determined.

Deepor Beel, Assam

Thirteen examples belonging to seven species of Cladocera (Crustacea) were identified.

Gobindsagar Dam, Himachal Pradesh

Thirty seven specimens comprising of six species of Fishes and one specimen pertaining to one species of Mammal were studied and recognised.

Khijaria lake, Gujarat

Seventy eight species of Avifauna were identified.

Nal Sarobar, Gujarat

Three hundred thirty three specimens belonging to 28 species of Fishes were identified.

Pong dam, Himachal Pradesh

Forty specimens belonging to 10 species of Fishes and eight specimens belonging to two species of Amphibia were recognized.

Flood plain lakes, Assam

As a result of studies conducted on zooplankton diversity of flood plain wetlands of this state, the plankton samples collected from different beels of Kamrup district were analyzed and 230 specimens belonging to 84 species of Rotifera, 11 examples belonging to seven species of Copepoda, 27 examples belonging to 14 species of Rhizopoda and 60 specimens pertaining to 36 species of Cladocera (Crustacea) were determined.

Estuarine/ Riverine Wetlands

Bahuda estuary, Orissa

As a result of studies conducted on the fauna of this estuary 44 specimens comprising 16 species of Fishes, 25 examples belonging to three species of Crabs, 51 examples belonging to 18 species of Molluscs, 31 examples belonging to four species of Diptera and 12 examples belonging to four species of Hymenoptera were recognised.

Vamsadhara-Nagaveli estuary, Andhra Pradesh

Four hundred seventy three specimens belonging to 74 species of Molluscs were identified.

Beas river, Himachal Pradesh

One hundred eighty two specimens belonging to 13 species of Fishes were recognized.

Rivers of Kerala

Two hundred seventy four specimens of 29 species of Fishes were identified.

Chauris of Ganges river, Bihar

Two hundred four specimens of 46 species of Molluscs, 12 examples of six species of Crustacea were identified.

Hooghly River, West Bengal

A status survey of the Gangetic Dolphin was carried out from Tribeni to Ganga Sagar and 102 dolphins were recorded. Besides 20



Fig.15 Brahmini kite – (*Haliastur indus*) – regarded as an auspicious bird
Irrawaddy Dolphins were also sighted.

Coastal/Marine

Shoreline habitats of southern Orissa

Seventy three specimens belonging to 23 species of Hymenoptera, 59 specimens comprising 16 species of Diptera, 34 specimens belonging to 22 species of Mantodea and 68 specimens belonging to 12 species of Crustacea were studied and determined.

Desert

Thar desert, Rajasthan

Five hundred and three specimens comprising 60 species of Coleoptera and 205 specimens comprising 32 species of Arachnida were studied and determined.

Ladakh Cold desert, Jammu & Kashmir

One specimen of one species of Mammal, five specimens belonging to two species of Reptilia, 42 specimens belonging to seven species of Fishes and 61 examples belonging to nine species of Orthoptera were recognized.

Himalayan

Pangi Valley, Himachal Pradesh

Forty three species of Birds were observed and 10 specimens of Reptiles belonging to two species were collected and identified.

Western Doon Shiwaliks, Uttarakhand

Fifteen specimens belonging to eight species of Amphibia were studied and recognised.

Other studies

- Pictorial Handbook on Butterflies and Moths of Madhya Pradesh - the diagnostic characters of 75 species of Lepidoptera (Butterflies) are under compilation.
- Pictorial Handbook on Amphibians of North-east India - the pictorial handbook is being prepared.
- Handbook on Mammals of Kerala - this handbook was Published.
- Handbook on Fresh-water Rotifers - the handbook has been prepared and is being published.

Identification and Advisory Services

The ZSI continued to render identification and advisory services at free of cost to research and teaching institutes in India and abroad, Central and State Govt./Agencies, Non governmental organisation, industries and individuals on Zoological matters. During this period 257 inquiries pertaining to different groups of fauna were attended to.

Development of National Zoological Collection

The ZSI, which is a national repository of Zoological specimens, maintains the collection of a large number of identified examples of species belonging to almost all groups of animals of the country. The National zoological collection was further enriched by the addition of 13016 identified specimens pertaining to 1165 species.

Training and Extension

During the year, four training courses and two workshops on specimens were organized by ZSI as follows

- Environmental Awareness and Wildlife Preservation,
- Collection, Preservation and Identification

of insects and mites of economic importance

- Insect setting and pinning and
- Refresher course in Collection and Preservation Techniques were organized during the period under report.
- AICOPTAX Workshop : Mollusca
- AICOPTAX Workshop : Nematoda

Publications

Records of Zoological Survey of India

- Vol. 104 Part 3 and Part 4
- Vol. 105 Part 1 to Part 4

Occasional Papers

- Studies on some Ethnomedicinal Arachnids and insects in relation to their usages as drugs among tribes of Sunderbans.
- A taxonomic review of the Chalcidoidea (Hymenoptera: Chalcidoidea) associated with *Ficus bengalensis* Linnaeus.
- The Deccan Mahaseer Fishes: their ecostatus and threat percept.
- Arachnid fauna of Nallmalai region, Eastern Ghats, Andhra Pradesh.
- Studies on Plant and Soil nematodes associated with crops of economic importance in Gujarat.
- Wetland mosquito fauna of Tamil Nadu.
- Faunal diversity of laterite hill system at Madaipara district, Kerala.
- Studies on fresh-water prawns of family Alyidae and Palaemonidae from Kanchipuram and Thiruvallur districts, Tamil Nadu, India including one new species of genus *Caridina*.
- Fish fauna of Kozhikode district, Kerala, South India.
- Amphibian fauna of Nagarjun Sagar Tiger Reserve.

Memoirs of the Zoological Survey of India

- Studies on some spiders from Eastern Coastal Region of India. Vol. 20, No. 3
- A taxonomic monograph on the world species of Termites of family Rhinotermitidae. Vol. 20, No. 4.

Bibliography of Indian Zoology

- Vol. 34(1997)
- Vol 35 (1998)

Handbooks & Pictorial Guides

- Birds of Chennai
- Dragonflies & Damselflies of Kerala
- Common Indian Dragonflies (Insecta: Odonata).

Special publications

- Validation of Threatened Mammals of India.
- Animals of India - Mammals.
- An Introduction to Taxonomy.
- Status of Kiang, Equas kiang, in Ladakh, H.P.

State Fauna Series

- Fauna of Andhra Pradesh (Part 5)
- Fauna of Arunachal Pradesh (Part 1 and Part 2)
- Fauna of Nagaland (Protozoa to Mammalia).

Fauna of Conservation Area

- Fauna of Melghat Tiger Reserve (Maharashtra)
- Fauna of Tadoba-Andheri Tiger Reserve (Maharashtra)

Wetland Ecosystem Series

- Fauna of Nathsagar Wetland (Maharashtra).

Publication Released

- Faunal Resources of India by Ms. Meena Gupata Hon'ble Secretary, MoEF

- Indian Butterflies (In Hindi) by Ms. Meena Gupata Hon'ble Secretary, MoEF
- Faunal Diversity of Western Himalaya by Sri. A K Goel , J. S. (CS-I) MoEF
- Status Survey of Kiang by Sri. A K Goel , J. S. (CS-I) MoEF
- Status Survey of Himalyan Marmot by Sri. A K Goel , J. S. (CS-I) MoEF
- State Fauna of Manipur (Part-1,2,3) by Hon'be Minister of Environment & Forests, Govt. of Manipur
- Fauna of Bannerghatta National Park, by Ms. Neeraja Nagaraj, Addl. Chief Secretary, Govt. of Karnataka
- Fauna of Biligiri Rangaswamy WLS by Ms. Neeraja Nagaraj, Addl. Chief Secretary, Govt. of Karnataka
- Fauna of Kudremukh WLS, by Ms. Neeraja Nagaraj, Addl. Chief Secretary, Govt. of Karnataka
- Faunal Diversity in Tiger Reserves : A compendium on 30 Years of Tigers Reserves in India by Ho'ble Prime Minister of India

Other Activities

- World Environment Day, Earth Day and Wildlife Week were celebrated at ZSI HQ, Kolkata and Regional Stations.
- Laboratory facilities and guidance were provided to a number of scientists (132), both from the country as well as from abroad in the laboratories of Headquarters and Regional Stations.
- A number of research scholars were guided by the Scientists of ZSI. Besides, ZSI scientists also participated in national and international seminars, workshops, training courses, etc. during the year.
- The book on Faunal Diversity of Tiger of India Reserves was released by the Hon'ble Prime Minister of India during the meeting of the National Board for Wild Life.

- Training Programme on E-Granthalaya was organized for librarians of BSI and ZSI. It is proposed to network libraries of the Circle Offices/Regional Stations of BSI and ZSI respectively.
- Website of Zoological Survey of India was launched during November, 2007. The website can be viewed at <http://www.zsi.gov.in>.

Forest Resources and Survey

Forest Survey of India, Dehradun

Introduction

Forest Survey of India (FSI), a premier national organization for forest resource assessment is working under the Ministry of Environment and Forests, Government of India. FSI is also engaged in providing the services of training, research and extension, besides carrying out forest and tree cover assessment. As per the recommendation of National Commission on Agriculture (NCA), FSI was set up in June, 1981 for collection of data on scientific lines through countrywide comprehensive forest resources survey at regular intervals. The FSI with its headquarters at Dehradun and four Regional Offices at Shimla, Kolkata, Nagpur and Bangalore, work in close coordination to carry out the various activities of FSI. Besides administration as well as technical control the major activity at the headquarters is forest cover mapping, data processing and conducting training. The zonal offices are mainly engaged in the inventory of forests and trees outside forests and supporting headquarters in other activities as and when assigned.

Objectives

After a critical review of activities undertaken by FSI, Government of India redefined the mandate of FSI in 1986 in order to make it more relevant to the rapidly changing needs and aspirations of the country. The major activities of FSI are as follows:

- To prepare State of Forest Report biennially, providing assessment of latest forest cover of the country through remote sensing technology and monitoring changes in these.
- To carry out the National Inventory of Forests and Trees Outside Forests (TOF) resources.
- To function as a nodal agency for collection, compilation, storage and dissemination of spatial database on forest resources.
- To conduct training of forestry personnel in application of technologies related to resources survey, remote sensing, GIS, etc.
- To strengthen research & development infrastructure in FSI and to conduct research on applied forest survey techniques.
- To support State/UT Forest Departments (SFD) in forest resources survey, mapping and inventory.
- To undertake forestry related special studies/consultancies and custom made training courses for SFD's and other organizations on project basis.

Activities and Achievements made during the year

Forest Cover Assessment

- Forest Survey of India (FSI) assesses forest cover of the country by interpretation of remote sensing satellite data and publishes the results in a biennial report called 'State of Forest Report' (SFR). Nine SFRs have been brought out so far, and the 10th SFR has now been published. Starting with data of US Remote Sensing Satellite Landsat for SFR 1987, FSI shifted over to the data of the indigenous satellites Indian Remote Sensing (IRS) in 1995. In the current cycle (i.e. for SFR 2005) FSI has used satellite data for IRS P6 Resource sat LISS III.

- The forest cover maps on different scales are kept in public domain and sold to the State Forest Departments and other user agencies on nominal price. Since 2001, the latest tree cover maps are available as hard copy and also in digital form.

National Forest Inventory

- Inventory of forests and Trees Outside Forests (TOF) is the second major activity of FSI. Forest growing stock (wood volume) has traditionally been a key indicator of forest wealth and its estimation has formed a major activity of forest resource assessment/inventory. In India, systematic forest inventory began in 1864 when the preparation of working plan started and has remained central to the forest management at divisional/district level.
- After the creation of the FSI the field inventory remained the primary activity with a modified design covering the whole country. The total forest area inventoried until the year 2000 was about 69.2 million ha which included some areas inventoried twice. Thus, more than 80 percent forest area of the country was inventoried comprehensively in a period of 35 years.
- A new National Forest Inventory (NFI) has been designed and adopted by FSI since 2002. The country has been divided into 14 physiographic zones and 60 districts randomly selected from these zones on probability proportional to size are inventoried in two years. About 8,000 sample plots are laid in forest areas distributed over the country in each cycle for field inventory. It has now been possible to generate a national estimate of growing stock on a two-year cycle. The first such estimate was published in 'SFR 2003.' As per design the accuracy of the estimate in subsequent cycles will improve by integrating the data of previous cycles. In addition to inventory of forests, Trees Outside Forests (TOF) resources are also

inventoried concurrently to provide a national estimate of growing stock of TOF on a two year cycle. In this case also about 8,000 sample plots are laid out in TOF areas. In the recent past TOF resources have gained importance because of their increasing role in meeting the needs of wood based industries and society.

- A total target of 28 districts have been fixed for inventory of forest and TOF to be completed during the year.

Training & Capacity building in modern survey methods

- Training unit of FSI has been imparting training to forestry personnel of the country since 1981 with the objective of disseminating knowledge and information on the modern techniques being employed in forest survey. Forestry personnel of various levels, working in the State Forest Departments are provided training in various disciplines like, Application of Remote Sensing (RS) and GIS in Forestry, Application of Geographical information system (GIS) in preparation of working plans, and Application of Global Positioning Systems (GPS) in Forest Survey and Demarcation, during in-house training courses of varying duration, organized throughout the year having a judicious mix of theoretical and practical orientation. Twelve courses on different themes are conducted by FSI every year. The Training Unit has imparted training to 2654 forestry personnel till December 2007.
- In addition, the technical staff of FSI is also trained frequently for up gradation of their technical skills to enable them to keep pace with the rapid advancements in this technology.
- During the year, FSI has to conduct 12 short term courses which includes three courses of two weeks duration on "Application of Remote Sensing and GIS

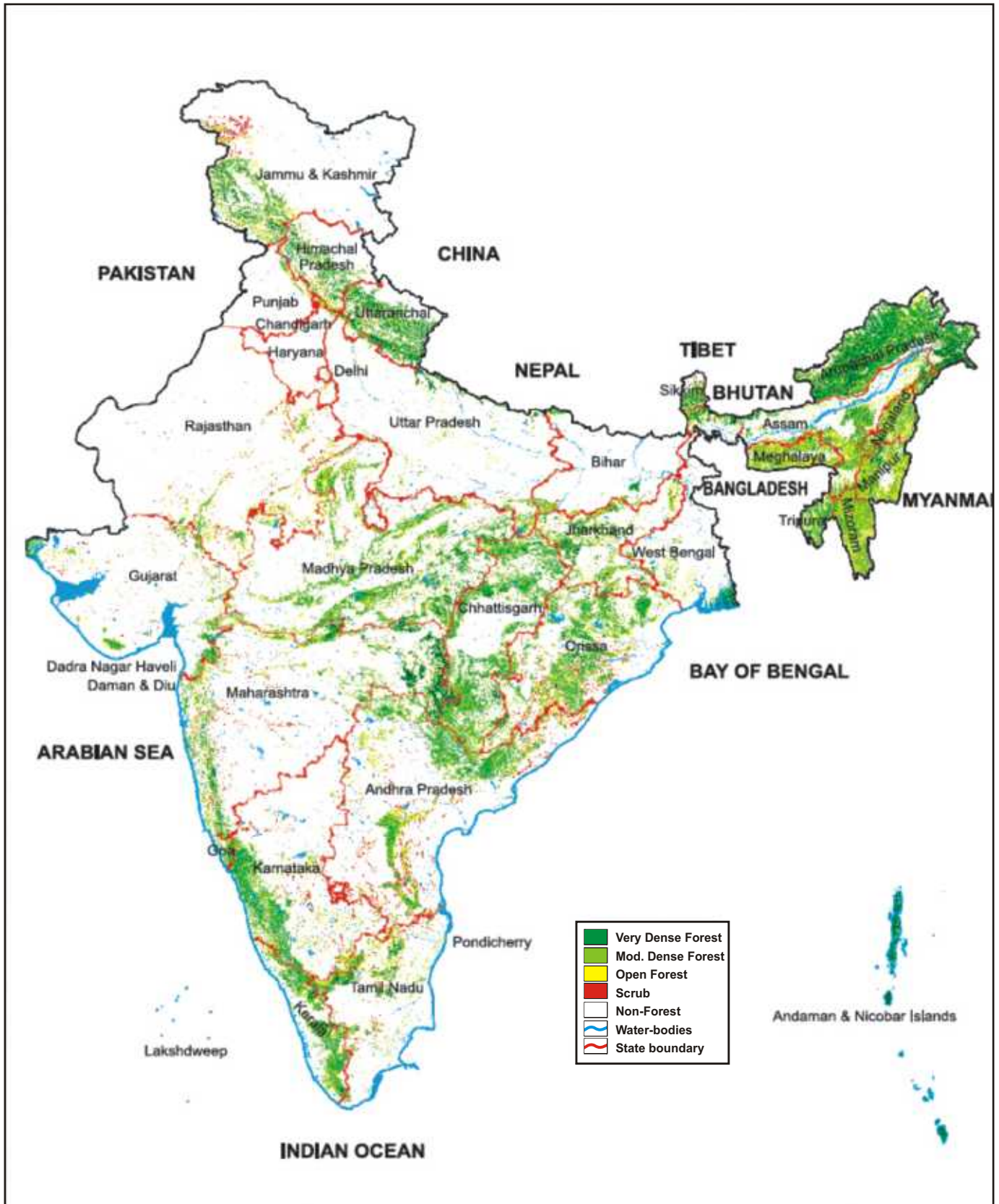


Fig.16 Forest cover map of India



Fig.17 A view of Annamalai forest

in Working Plan Preparation” for CF/DCF/ACF level officers, one advance course of two weeks duration on “Application of GIS in Forest Resource Management” for DCF/ACF level officers, five courses on “GPS Application in Forest Survey and Demarcation” of one week duration, one course of two weeks duration on “Inventory Techniques, Image Processing and GIS Applications in Forestry for Range Forest Officer and two compulsory courses for IFS officers.

Outreach Training Programmes

- Besides in-house training courses, FSI also conducts training courses designed to meet the specific demand of various State Forest Departments at their place of choice of location and duration. This year, FSI imparted training to 25 MIKE site officers on “Spatial Referencing of Monitoring of Illegal Killing of Elephant (MIKE) Data” at Bandipur, Karnataka in December, 2007.

Project Based Activities

National Forest Type Mapping

Forest Survey of India has undertaken a project on mapping of forest types of India which is based on Champion and Seth classification. The project under the National Natural Resource Management System (NNRMS), aims at mapping of forest types of India at 1:50,000 scale. The methodology includes GIS analysis of the spatial layers such as rainfall, temperature, altitude zones, soil, thematic maps, interpreted remote sensing data, and related attribute data sets. Taking district as a unit, extensive ground truthing covering all the forest types is being done for all the districts of the country. Consultation with the State Forest Departments and experts in the field is part of the methodology.

Near Real Time Monitoring of Active Fires using MODIS based Web Fire Mapper

FSI is monitoring forest fires of the country since 2004 using remote sensing based system developed by the University of Maryland (USA) and NASA viz MODIS Rapid

Response System. The detection of forest fires is made on the daily basis through the website <http://maps.geog.umd.edu>. After collecting coordinates of the fire spots, FSI maps the forest fires through GIS analysis. The coordinates of all the forest fires are then sent to the respective State Forest D for control during fire season. From the feedback received from SFDs, it has been found that the detected forest fires are correct on more than 95% points.

Inventory of Trees Outside Forest in Uttar Pradesh (U.P.)

- On the request of UP Forest Department, FSI generated estimates of growing stock in TOF of UP for all 70 districts by species and dia class wise on the basis of data inventoried by FSI in the past of selected districts.
- The estimated total wood volume in TOF Uttar Pradesh was found to be 87.31 million M3 and the average annual yield as 5.6 million M3.

Inventory of Trees Outside Forest in Five Districts of Uttarakhand

- On the request of Uttarakhand Forest Department, Forest Survey of India (FSI) took up inventory of Trees Outside Forests (TOF) in five districts of Uttarakhand, to assess the availability of raw material for establishing wood based industries in the state in the areas which are below 1000m altitude. Of the five districts, entire area of two districts namely Udham Singh Nagar and Haridwar fall below 1000 m whereas in other three districts namely Dehradun, Pauri Garhwal and Nainital only parts of the area falls below 1000m altitude. After demarcating such areas, inventory was carried out in entire rural areas of two districts and in areas below 1000m in the remaining three districts.
- With the help of the remote sensing data TOF resources of the districts were identified and stratified into three stratum

namely, block, linear and scattered. Optimum number of sample plots were laid out in each stratum for enumeration and measurement of all trees with diameter 10cm and above.

Estimates of Growing Stock in TOF of Karnataka

- Karnataka Forest Department requested FSI to make an assessment of the growing stock of trees in the private plantations of the state on the basis of information available with FSI on a project basis.
- For this purpose, the state of Karnataka was stratified into three strata based on moisture regime and vegetation. The inventory data of selected districts available with FSI was used to generate estimates for the three strata independently. Estimates of stems per ha and volume per ha were generated according to species and diameter class for block, linear and scattered stratum under each strata. By aggregating the estimates of stems and volume of all the three strata, the estimates according to species and diameter class at state level have been prepared.
- The distribution of estimated stems and volumes have been disaggregated in two categories namely, timber/small timber/pulpwood species and other species based on the information received from literature and same has been presented in the report.

Assessment of Coral Reefs in India

- This project aims at digital mapping and preparation of Coral Reef Atlas using remote sensing data of the coral reefs of the four major coral reef sites in India viz. Gulf of Munnar, Gulf of Kutchh, Lakshadweep and Andaman & Nicobar Islands. Delineation of Coral Reefs have been completed for all the sites and maps are under preparation.

Assessment of Mangroves

- Assessment of Mangroves and monitoring their health has been taken up by FSI as a project. Assessment of mangroves on community basis was to be carried out in the states of Maharashtra, Goa, Karnataka, Kerala, Pondicheery, Andhra Pradesh and Orissa. About 70% of the ground truthing work was completed and health assessment had been done in Corringa Wildlife Sanctuary of Andhra Pradesh.

Technical Advisory Committee (TAC) of FSI

- The Technical Advisory Committee (TAC) of FSI was constituted by the Ministry in November, 2006 to oversee the technical activities of FSI. So far two meetings have been convened.

First TAC Meeting

- The first meeting of the TAC was held on March 2, 2007 at Dehradun. The major recommendations are given as follows:

National Forest Cover Mapping

- TAC fully endorsed the present methodology followed by FSI on forest cover mapping including accuracy assessment and made following two suggestion for the future
 - to use ortho-rectified images for forest cover mapping in hills and
 - to follow vector based mapping of forest cover in future assessments instead of raster approach presently followed to enhance the cartographic presentation of the output, accurate mapping of changes and improving the efficiency of interpretation.

FSI proposal for the XI Five Year Plan

- TAC took a special note of the FSI proposal for the 11th Plan for promoting application of Geomatics in forest management including NTFP inventory in the State Forest Departments.



Fig. 18 A mangrove corridor in Andaman & Nicobar Islands

Inventory of Forests & TOF

- TAC recommended to make a pause of the new National Forest Inventory (NFI) which started in 2002 with a view to undertake an in-depth evaluation of the NFI design and adequacy of the results; and publish detailed findings in the form of a National Report. Already data of more than 120 districts representing different physiographic zones are available, for detailed evaluation. This exercise will help FSI to make a smooth transition to changes proposed for inclusion during the XI Five Year Plan period.

Other Topics

- A mechanism should be evolved to upgrade the capacity of the technical staff of FSI in application of Geomatics and forest inventory on a regular basis by imparting training in India and wherever necessary abroad.

Second TAC Meeting

Second Meeting of the TAC was held on December 19, 2007. Major recommendations of the TAC are

- FSI should initiate immediate action for the creation of additional posts/staff to complete in time new activities as proposed in the XI Five Year Plan. Staff expansion is an essential requirement to fulfill the expanded mandate of FSI.
- TAC fully supported the proposal that the responsibility for the development of National Forest Database Management System (NFDBMS), including information need and functional analysis, be transferred from the Ministry to FSI as soon as possible.
- FSI should initiate production-consumption study of forest products at national level on a priority basis.
- should develop a comprehensive technical exchange programme with other reputed

national and international institutions at technical and professional level and remain at the cutting edge of the technology in the fields of Geomatics, Inventory techniques and strategic forestry planning.

Survey and Utilization (SU)

The following programmes / objectives related to forestry sector are dealt by Survey & Utilisation Division of the Ministry.

'Forest Certification' of Timber, Non-Timber Forest Products

- Forest Certification has emerged as a market-based mechanism in support of Sustainable Forest Management (SFM). Certification initiatives rely on consumers exercising purchasing choice in favour of products labeled as originating from forests certified to have been sustainably managed. Certification and Eco-labeling are the new mantras to enhance the product positioning for a premium price on one hand and ensuring better forest management practices on the other hand.

Objectives of certification

- A system that assures the public that environmental concerns and values have been addressed.
- Manage resources holistically so that healthy environments are maintained.
- Control resource management techniques.
- Control resources economically
- Improve livelihoods
- Diminish the amount of regulation that is being imposed on a forestland owner
- Balance the need to extract resources from the environment while maintaining sustainable ecosystems.
- Control the values of private forestland owners, or for private forestland owners to maintain their values in the face of society's drive to impose its values on them.

General Types of Certifications

Depending on the party responsible for certification and defining of standards, the process can be classified as:

- First party certification: it's an internal assessment process, where the organization itself sets up standards to evaluate its own management systems and practices.
- Second party Certification: The assessment is done by the consumer or an outside trade organization.
- Third party Certification: The standards are pre-defined and accepted, against which the performance of the applicant is evaluated.

There are different 'forest certification' processes in the world such as;

- Swedish FSC standard for 'forest certification'
- Programme for Endorsement of Forest Certification (PEFC)
- Canadian Standards' Association
- ISO 14,000 (International Organization for Standardization) Series
- Malaysian Timber Certification Council (MTCC)
- Phased Approach of International Tropical Timber Council (ITTC) Towards 'Forest Certification'
- In recent times, there has been a paradigm shift for timber oriented forest management to Non-Timber Forest Products oriented multi-type forest management. Standards for certification of Non Timber Forest Products (NTFPs) include the technical specification of the raw-materials as well as the process materials required by the end-users and industry e.g. pharmaceutical industry in case of medicinal plants. NTFPs are collected by the local communities in India

and therefore, before setting any standards both for product as well as management practices, a detailed in-depth study/research is highly inevitable for each of the NTFPs with respect to silviculture management, harvesting and post-harvesting practices in order to ensure the requisite quality of raw-materials for user industry in the country and abroad.

- The very basis of modern management of forestry in India is and has been sustainable yield, which in real terms is sustainable management. Even during the pre-modern era, management of forestry was given high importance and was also in sustainable manner. Thus, the term Sustainable Forest Management (SFM) is not new to the Indian Forestry. But, 'Forest Certification' is a relatively new concept to India.
- The National Forest policy, 1988 maintains the long term viability of commercial forests, protects bio-diversity and provides a continuous stream of social and economic benefits. In India timber markets largely dictate forestry practices. India thus, has to initiate a process of certifying forest/forest products to get access to Green markets and receive a premium price in the international market. This shall ultimately benefit the local communities by sustainable and improved price for the resources and value added handicraft products etc.
- Bhopal-India process evolved criteria and Indicators for SFM but they are yet to be implemented at the national level. Looking at the development in the global scenario, it has become imperative to have a national policy on 'forest certification'. From domestic (National) point of view also, certification is necessary to ensure the continuity of forest goods and services through SFM approach.



Fig.19 Forest certification meeting organized in the Ministry

- The Ministry constituted a National Working Group/Governing Body to frame the policy guidelines on 'Forest Certification' for timber and NTFPs. The National Working Group / Governing Body also finalized the 'Terms of Reference (TOR)' for the following three committees:
 - Committee for 'Certification Criteria'
 - Committee for 'Certification Processes'
 - Committee for 'Accreditation Criteria and Processes'

With the objective to prepare the road map and the necessary criteria and processes for the National certification of forests, timber and Non-Timber Forest Products etc. in the country at par with the International standards.

- The first meeting of these Committees were convened on 10-13th October, 2007 in the Ministry. It was attended by a large number of stakeholders from different parts of country and abroad. It was decided that Principles and Rules for standard setting must be prepared whereas the Criteria and Indicators may form the basis for the same. Similar efforts will be made to develop Criteria & Indicators for areas outside forests and for the development of standards and harvesting methodology for Non-timber forest products including medicinal plants.

It was unanimously agreed that an independent autonomous forest certification council may be set up as owner of the National Forest Certification Programme and to primarily take care of Standard setting and accreditation for the same which can be internationally recognized / accepted.

Study of Applied Rates and the Import Duties of Forestry Products for Multilateral and Bilateral Trade Negotiations

- A study report on Domestic sensitivity on imports was given by Research Information System (RIS) for the Non-aligned and other developing countries. This study had been commissioned by the Department of Commerce for recommending the various tariffs to be imposed for import. Ministry of Environment and Forests then constituted a Core Group consisting of experts and representatives from the stakeholders to study the report. The Core Group recommended the report of the RIS, which was mainly related to the bound-rates essential for the Ministry of Commerce and Industry for the WTO Negotiations. These recommendations are as follows:-
 - In general, the country should follow the conservative scenario proposed in the RIS study Report in respect of wood and forest products sector albeit with higher tariff escalation in case of some selected items.
 - In respect of round wood logs, wood pulp, and scraps although the bound rate may be reduced from the current 25% to 16% as worked out in the RIS Report in the conservative scenario, the applied tariff should be maintained at the current level i.e. 5% till the country attains self-

sufficiency in respect of industrial round wood using allowable cut from the natural forests supplemented by harvests from plantations.

- In respect of finished products like Plywood, Particleboard, Fiberboards etc. the bound rate need to be kept at the present rates i.e. 40% although the conservative scenario indicates bound rate of 22.5%- 25.8% which is lower than the applied rates of 25% against the current bound rates of 35-40%. This recommendation of the core group is guided by the facts that a large number of plywood, veneer industries have come up recently after 1996 (i.e. promulgation of Hon'ble Supreme Court Order in Writ Petition (Civil) No.202/1995 resulting in closure of these units based on the raw material procured from North Eastern States). These are recent Small-Scale Industrial units and function primarily on domestic plantation grown timbers. These industries require not only facilitation for adoption of modern processing technologies but also protection against imports to attain global standards and competitiveness.
- For negotiating at the WTO we should start from bound rates, which gives more flexibility compared to the applied rates. Moreover, since applied rates are much lower than the bound rates, any reduction in bound rates in the course of negotiations are not likely to have immediate adverse impact on import of wood/wood products.
- Besides the bound-rates, the applied rates and the import duties etc. are the factors which play significant role in the import of commodities including forestry products and in the multi-lateral/bilateral trade negotiations. To protect the interest of farmers regarding agro and farm forestry and the forestry products like resin and rosin, there is an urgent need to have a detailed dialogue/discussions to recommend some solutions, by way of fixing annual quota or by revising/introducing increased import duties, commodity-wise and within the forestry sector, species-wise.
- It has been referred by various entrepreneurs and stakeholders that on account of liberalised import policy and reduction in import duties on resin and rosin, the price of domestic resin have come down. This has resulted into a major disincentive to the farmers to further grow and protect Chir tree. It has also been mentioned that on account of liberalised import policy and reduction in import duties on Gambier, the price of Khair (*Accacia catchu*) and Katha have come down drastically in the State of Himachal Pradesh. Gambier is largely used for tanning leather. It is also being used as a substitute of Katha by nefarious pan masala/ gutka manufactures. Gambier is injurious for human consumption. This policy has adversely affected the genuine katha traders and is discouraging the farmers from growing khair trees.
- In view of these facts, the Ministry of Environment and Forests constituted a Core Group to study the applied rates and the import duties which play a significant role for import of commodities including forestry products and in the multi-lateral/bilateral trade negotiations so that various alternatives may be discussed alongwith objectives and constraints and correct specifications of the models encompassing the timber and other forestry products in raw, semi-finished and finished form, can be formulated. These discussions were highly essential to comment on forestry products for Preferential Trade Agreement (PTA), Free Trade Agreement (FTA) etc.

- A series of meetings of the Core Group were held on 6.9.2005, 9.3.2006 and 19.7.2006 and 3rd July, 2007 and the Core Group has also given the recommendations for rationalizing the duty structure on forestry items. The Core Group further identified the different ITC (HS) Codes to be kept in the Negative list with no reduction in tariff whereas some items were kept pending at the request of the representative of FICCI and they were asked to give detailed justification to keep those items under Negative List, if so to safeguard the interest of domestic industries. It was also decided that though all the items of ITC (HS) Code 4403 and 4406 may be kept under the Negative List with no reduction in tariff but it should be country specific in bilateral / multilateral trade negotiations which of course will depend on the quantum of trade and their economic values vis-à-vis economic scenario in different PTA's/FTA's etc. keeping the environmental and ecological sensitivity of the items under these codes on top priority.

International Tropical Timber Organization (ITTO)

- The International Tropical Timber Organization (ITTO) was established by the International Tropical Timber Agreement (ITTA), 1983 to administer the provisions of ITTA and also to supervise the operation of the Agreement. The ITTO is a commodity organization bringing together the producer and consumer member countries to discuss and exchange information and develop policies of all aspects of the World Tropical Timber Economy. The Headquarter of ITTO is Yokohama, Japan. There are 59 member countries in ITTO at present. Out of these 59 countries, there are 33 Producer member countries and 26 Consumer member countries. India

belongs to the group of the producing member countries. The ITTO's membership represents 90% of world trade in tropical timber and 80% of the world's tropical forests.

- ITTO members in 1990 agreed to strive for an international trade of tropical timber from sustainably managed forests by the century's end. This commitment became known as the Year 2000 Objective, and a large part of the ITTO programme of projects and activities are devoted to its achievement. It remains a central goal of the Organization, supported by renewed efforts to raise the capacity of government, industry and communities to manage their forests and add value to their forest products, and to maintain and increase the transparency of the trade and access to international markets. One recommendation of the assessment made in 2000 was to send ITTO missions to tropical member countries to identify the limiting factors towards achieving ITTO Objective 2000 and to formulate action plans to overcome them.

India as a member of ITTO enjoys the following privileges of

- Participation in the biennial Sessions of ITTC where views are exchanged with other member countries benefiting the timber trade of India.
- Financial assistance to projects on forestry in India.
- International news and trends on timber trade.
- Information on topical and current issues of forestry.
- Funding of Workshops in India to interact with and impart training to Indian Forest officers/officials and other stakeholders.

- During the year, India actively participated in the successive International Tropical Timber Council (ITTC) Session, Expert Panel Meetings and International Conferences. The Projects titled 'Regional Workshop on processing, marketing and trade of quality wood products and teak plantations' submitted by Kerala Forest Research Institute (KFRI), Kerala and the 'Sustainable and multipurpose forestry to settle the tribal shifting cultivators of Tripura State in India by providing viable economic activities' submitted by Tripura Forest Development and Plantation Corporation Limited (TFDPCL), Tripura have been approved and funded by ITTO.
- The 'International Tropical Timber Agreement (ITTA), 1994' successor agreement of ITTA, 1983 was negotiated in 1994 and came into force on January 1st 1997. The ITTA, 1994 was renegotiated under the auspices of UNCTAD, Geneva, Switzerland to formulate a new Agreement, ITTA, 2006 which shall enter into force definitively or provisionally on or after 1st February, 2008 or any date within six months thereafter. The Indian delegation actively participated in all the four rounds of negotiations and contributed significantly towards the finalization and adoption of this new agreement. This new agreement is now open for ratification.
- The Union Cabinet of India has given its approval for the ratification of ITTA, 2006 on 15th November, 2007 which will help in India's contribution to the International trade in tropical timber and will generate goodwill to the country and enhance the status of India on the World forestry map under the aegis of this UN Organisation.

Sustainable Forest Management (SFM) Cell

- Sustainable Management of Forests is of immense significance due to its

contribution towards sustainable development. It is therefore, imperative that Sustainable Forest Management (SFM) is introduced and its monitoring and assessment using Criteria and Indicators (C&I) framework be operationalised. In pursuance to the recommendations of the National Task Force on Sustainable Forest Management and the recommendations made at the National Workshop on Criteria and Indicators organized at IIFM, Bhopal, from 24-28 April, 2006, Sustainable Forest Management (SFM) Cell has been created in Survey & Utilisation Division in the Ministry with the following Terms of Reference (TOR):

- To act as the Nodal point for all matters related to Sustainable Forest Management in the country and to encourage the development of National programmes aimed at sustainable utilisation and conservation of forests, and maintaining their ecological balance.
- To promote the development of practical methods, guidelines and strategies to apply the ecosystem approach in the management of natural forest areas, keeping into account the regional and ecological differences in the forest areas.
- To facilitate the common understanding of concepts, terms and definitions related to Criteria and Indicators and to strengthen the Criteria and Indicators process and Inter-process cooperation.
- To develop the mechanism for implementation of Criteria and Indicators for Sustainable Forest Management and to strengthen the related communication and information management systems.

- To promote the sustainable use of forest resources in order to enhance the conservation of forest biological diversity.
- To enhance and improve the technical capacity required at the national level to monitor SFM and biological diversity.
- To integrate the broad framework of the Sustainable Forest Management principles into the Working Plan Code of the Ministry.
- To create a synergy between the C&I developed through the Bhopal – India Process and the C&I developed by other agencies at the international level e.g. C&I developed by the ITTO.
- To create awareness and improve the knowledge base and to assist in development of infrastructure for accurate assessment and monitoring of Sustainable Forest Management.
- To facilitate the setting up of similar Sustainable Forest Management Cells in all the State / UT Forest departments.
- Create awareness and sensitize various stakeholders and enhance their capacities towards C&I approach.
- Encourage research and development on various aspects of C&I such as development of sets of C&I at state level, determining standard values (Minimum Acceptable Standard-MAS) for the indicators at national/state/FMU levels.
- Facilitate information/data collection on C&I and exchange from different State / UT Forest Departments in the country.
- Encourage collection and dissemination of information to the stakeholders through newsletters and dedicated website etc.
- Encourage participation of local communities through awareness, capacity building towards application of C&I at FMU level including monitoring and functioning of institutional framework.
- Encourage incorporation of C&I approach in the training curricula of forest colleges/and teaching curricula of Universities and educational institutions.

The main functions of Sustainable Forest Management (SFM) Cell are

- Co-ordinate developing C&I action plans with the State / UT forest departments.
- Enable political and administrative environment toward C&I approach for SFM.
- Institutionalise C&I approach through incorporation in the National Working Plan Code and its application in the states.
- Apply C&I approach in the country in light of the Objective 2000 – certification of forest products (particularly NWFPs)
- The First meeting of the Sustainable Forest Management Cell was convened in the Ministry on 26-27 July, 2007 to encourage the development of National programme aimed at sustainable utilization and

conservation of forests and maintaining their ecological balance. The 8 Criteria and 43 Indicators developed under Bhopal-India Process were discussed at length in the background of experiences regarding their operationalisation in the Forest Management Units (FMUs) in Madhya Pradesh and Chhattisgarh. As a result, in the two days meeting, a detailed matrix of improved/modified Criteria and Indicators were developed with the active participation and contribution of members and special invitees which have been sent to all States/UTs for their comments. Moreover, a number of recommendations were made to prepare the road-map for the development of standards on the basis of Sustainable Forest Management of forests through improved/modified C&I with necessary annotations / norms for indicators and their periodicity. The major recommendations are

- Like the SFM Cell in the Ministry, all the States and UTs must create SFM Cell with similar Terms of References and Functions.
- The harmonized / improved Criteria and Indicators developed under Bhopal-India Process may be operationalised by all the States /UTs in India and their comments may be obtained.
- IIFM, Bhopal must be instrumental in getting the feedbacks from the operationalising C&I States / UTs for the fine-tuning of C&I in consultation with such States / Uts.
- The roadmap may be prepared by IIFM for the monitoring of C&I for SFM in different States / UTs giving necessary emphasis on JFM.
- The roadmap (not more than 2 pages) may be prepared by IIFM, Bhopal for the certification of 'Forests' in this context.
- The whole India may be divided into six (6) Regions and Regional offices may be entrusted with the responsibilities of monitoring of C&I for SFM.
- The State Governments must take necessary steps to sensitize / create awareness among their staff and the members of the JFM committees for SFM through C&I.
- The State Governments / UTs Administration must avail the opportunity of necessary funding for these activities under NNRMS Scheme of Ministry of Environment and Forests.
- An independent 'Indian Forest Certification Council (IFCC)' must be created in the XIth Five Year Plan.
- Ministry must take up the studies such as
 - ▲ Forest Resource Accounting System
 - ▲ Unrecorded removal of fuelwood and fodder from forest areas.
 - ▲ Unrecorded removal of Non-Timber Forest Produces (NTFPs) from forest areas.

The experiences of one study by Indian Institute of Economic Growth may be utilized for the study (a) above.

- The necessary provision of financial assistance in the form a 'Scheme' at the National level is required to increase the pace of operationalisation of C&I for SFM throughout the length and breadth of the country.
- IIFM, Bhopal may examine the C&I in view of the State Acts / Rules, National Acts and recent Tribal Act.
- The C&I for SFM once accepted at the National level may be incorporated in the Working plan code making it mandatory for the States to prepare the Working Plan accordingly.

- For preparing the detailed documents regarding Annotation / norms of C&I, the IIFM may be given this job whereas some field officers and retired forest officers may be associated by the Ministry.
- The outcome of the two days' meeting of SFM Cell (26 – 27th July, 2007) and working draft of C&I may be sent to all the States / UTs, IIFM and all members, attending invitees and concerned for their comments.

National Multi-Disciplinary Team to combat smuggling of Red Sanders

- As per the initiative of this Ministry, a 'National Multi-Disciplinary Team' has been constituted to combat the smuggling of Red Sanders, under the Chairmanship of Director General of Revenue Intelligence. The other members are Export Commissioner/Joint Director, DGFT, and DIG (SU) from MoEF. The first meeting of the National Multi-Disciplinary Team took place on 18th July, 2006 and various important decisions were taken to control the smuggling of Red Sanders especially in custom's area. Sharing of information and need for constituting Regional Multi- Disciplinary Teams were also recommended. As a result, three Regional Multi- Disciplinary Teams were constituted at Chennai, Kolkata and Mumbai and they have also started functioning by forming a team of Forest Officers from State Forest Departments, representatives from Ministry of Commerce and Industry and Deputy Directors (Wildlife) under the Chairmanship of Additional Director General, Directorate of Revenue Intelligence.
- The National Multi-Disciplinary Team and Regional Multi-Disciplinary Team are meeting regularly to combat the smuggling of Red Sanders by establishing

a team. The second National Multi-Disciplinary Team meeting held in New Delhi on 21.8.2007. The sharing of data, information, training and mutual understanding to solve the problem in the port areas are the basic issues being discussed in such meetings. Besides, the three Regional Multi-Disciplinary Teams at Chennai, Mumbai and Kolkata, recently it has been decided to open three more Regional Multi-Disciplinary Teams at Ahmadabad, Lucknow and Bangalore. Moreover, the scope of these teams has been increased to cover all forestry and wildlife items.

Development of National Forestry Database Management System (NFDMS)

- The Ministry constituted an Expert/ Advisory/ Working Group with an aim to support the implementation of an integrated National Forestry Database Management System (NFDMS) in a comprehensive manner including strengthening of the technological, institutional and human capabilities to ensure continuing and effective dissemination and use of forest statistics. Since the preparation of 'blue print' towards the development of NFDMS is a pre-requisite for the development of software and necessary data networking for the same, the Expert Group recommended to carry out the Information Need Analysis (INA), Functional Requirement Study (FRS) having necessary interactions with the States/UTs in smaller groups to address the problems and identify the region specific parameters for necessary data collection, compilation and dissemination promptly. The Project "Preparation of a blueprint towards the development of a National Forestry Database Management System (NFDMS)" has been approved and is currently underway.

Special achievements during the year

Release of book "National Forestry Database Management System" - A Vision"

- On the occasion of World Forestry Day on 21st March, 2007, Hon'ble Minister of Environment & Forests, Government of India released the book 'National Forestry Database Management System – A Vision', which is a compilation of the presentations in the meetings by the Expert Group constituted by the Ministry to guide the development and implementation of the National Forestry Database Management System (NFDMS). The information contained in this book will be of great value in deciding factors/parameters and preparation of road map by the State Forest Departments and other stakeholders for the development of Forestry Database in the country.
- The contribution of forestry sector towards the economy of the country is immense. However, this contribution has been grossly underestimated for want of proper statistics. The haphazard collection of data in the forestry sector and most of the time their unavailability has been the focal point of discussions at various forums and this became more pronounced when the contribution of the forestry sector to the Gross Domestic Product (GDP) of our country could not be calculated directly and had to depend on indirect methods of estimation. This book compiled and edited by Dr. Bipin Behari, Deputy Inspector General of Forests will specify the road map and it will go a long way in guiding the State Forest Departments, Scientists, and the people in the development of the proper collection, compilation and dissemination mechanism in the forestry sector right from the grassroots level to the National level.

Regional Workshop on "Processing and Marketing of Teak Wood Products of Planted Forests"

- Regional Workshop on 'processing and marketing of teak wood products of planted forests' took place at Kerala Forest Research Institute (KFRI) in Peechi, Kerala, India from 25-28th September, 2007 successfully. This has been through a pre-project with the financial assistance from International Tropical Timber Organisation (ITTO). The major Recommendations / outcomes of the Regional Workshop are:-

Policy & finance

- Formulate appropriate (sub) policy on teak within the national forests, landuse, industrial processing and socio-economic policies ensuring sustainability and the development of an enabling environment for the long term security of investments.
- Establish and implement a comprehensive system of planning (involving long, medium and short term plans; and sites/locations, systems and market) for teak resource development.

Wood property analysis

- Enhance the knowledge base of the wood properties and machineability of short rotation plantation teak - including those grown outside forests (ToF) - so as to ensure that they are processed within the acceptable tolerances of other tropical timbers.

Processing Technology

- Develop new/innovative conceptual models for teak processing industries based on Best Available Technology (BAT) and the experiences from other industries.

Marketing

- Develop common grading systems to support vibrant teak sector for the value-

added processing of plantation teak wood. Develop market information system for collection, collation and dissemination of teak trading volume and price information

R & D and Training

- Evaluate, document and disseminate R & D findings
- Promote tree improvement through:
 - Globally coordinated R& D and
 - Facilitating process of exchanging genetic materials.
- Appraise the processing technology in use in the context of the new developments in research and transfer to the field.
- Conduct comprehensive socio-economic studies of teak under different technological systems as a means to attract investment flows.
- Undertake growth and yield studies by consolidating data from international network of sample plots.

Code of Best practices

- Develop and promote sustainable practices for teak wood production and utilization codes (social, environmental and economic)

International cooperation and coordination / networking

- Strengthen regional and international cooperation, collaboration and coordination in teak development with special emphasis on human resource development.
- Support KFRI, one of the lead institutions, to host the secretariat of TEAKNET and establish linkages with other national, international and NGO networks in collaboration with FAO and ITTO.
- Identify and analyse unsolved and emerging problems (both technical and non-technical) and initiate and implement

measures to address them adequately in a coordinated and collaborative manner.

- Prepare and submit the regional projects to international donor agencies in thrust areas, viz. processing and marketing, productivity/ genetic improvement and social/ecological/policy issues.

Study of Current Market Prices of Timber in the States of Himachal Pradesh, Jammu & Kashmir and Nagaland

- This Study has been given to Forest Research Institute (FRI), Dehradun with the following Terms of Reference (ToR):
 - Study of the timber species and their specifications as being procured by DGS&D and their prices at different level alongwith their trend of procurement and change in prices etc.
 - Study of the market prices of the softwood species in Himachal Pradesh and Jammu & Kashmir and hardwood species in Nagaland vis-à-vis their present rates etc. through DGS&D.
 - A complete matrix showing the timber species, their prices specification-wise leading towards fixing of the prices for the procurement of timber through DGS&D, giving necessary service charges etc. to the Forest Corporation of the States, as per practice in vogue.
 - The necessary economic analysis and price flow charts may be prepared showing the trend for the future planning and above all for fixing the prices of timber species specification-wise for the necessary procurement by DGS&D from the States of Himachal Pradesh, Jammu & Kashmir and Nagaland.
- The rates of timber specieswise both softwood and hardwood for all the relevant specifications will help in fixing prices for timber for the purpose of Director General of Supplies & Disposal (DGS&D).

- The draft report has been received from Director, FRI whereas a meeting to this effect was convened on 15th November, 2007 under the Chairmanship of Additional Director General of Forests. It was decided that Director, FRI will obtain necessary information from Principal Chief Conservator of Forests, Nagaland and other such concerned organizations and will submit the final report at the earliest. It was also highlighted that all the Government Departments must procure timber both softwood and hardwood through DGS&D to avoid illegal procurement through different types of auction bids. The fixation of price of timber on the basis of the above study will help a great deal in procurement of timber through DGS&D by the Government Departments.

Report of the Scientific Expert Committee on the 'Status of forests and other allied matters in the A&N Islands'

Ministry had constituted Scientific Expert Committee under the chairmanship of Prof. C.R. Babu to go into the Report of Shri Shekar Singh on 'Status of Forests and other Allied Matters in A&N Islands' in the post-tsunami scenario. The said Scientific Expert Committee has submitted its report to the Ministry.

The Andaman and Nicobar Islands Forest and Plantation Development Corporation Limited (ANIFPDCL)

- Andaman and Nicobar Islands Forest and Plantation Development Corporation Limited (ANIFPDCL) is a Government of India Public Sector Undertaking, created in 1977 with the broad objectives of development and managing forestry plantations on the Islands. This Corporation has three main activities namely (i) Forestry Project, (ii) Red Oil Palm (ROP) project, and (iii) Katchal Rubber Project (KRP) in operation. While the Forestry Project contributed 75 % of the

turnover and provided a revenue surplus, the Red Oil Palm Project provided marginal surplus, and the Rubber Project was loss making from the very beginning.

- After the Hon'ble Supreme Court's order dated October 10, 2001, the activities of the Corporation started reducing, as its main activity was timber operation. However, efforts have been made to revive the Corporation by restructuring in public interest. A Cabinet Note was prepared in view of the natural catastrophe in the form of earthquake and Tsunami on 26th December, 2004 and it was submitted to the Cabinet Secretariat on 29th December, 2005 after having necessary comments from the concerned Ministries but decision was deferred. This draft Cabinet Note sought the approval of Cabinet to downsize the ANIFPDCL and reduce its current liabilities in an attempt to ensure its revival. The Corporation is also in the process to diversify its activities wherever possible within the ambit of its objectives.
- It was decided subsequently to revise the draft Cabinet Note in view of the diversifying activities proposed by ANIFPDCL. And therefore, it was further decided to revise the Cabinet Note in view of the report of the Scientific Expert Committee constituted under the chairmanship of Prof. Babu to go into the Report of Shri Shekar Singh on 'Status of forests and other allied matters in A&N Islands.' Since the Scientific Expert Committee has submitted its report, the matter is being discussed with the A&N Administration and ANIFPDCL to revise the Cabinet Note in view of the possible diversifying activities and necessary downsizing of the surplus staff for the same. Government of India is providing loan to ANIFPDCL again to meet its urgent liabilities such as salaries, wages etc. as well as their other statutory requirements.