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**Natural Resources -  
Survey and  
Exploration**



## Survey of Flora

### Botanical Survey of India

#### Introduction

The Botanical Survey of India (BSI) was established on February 13, 1890 with its headquarter at Kolkata and its 10 circle offices through out the country with the basic objective to explore the plant resources of the country and to identify the plants species with economic virtues. As a part of scientific development of the country it was reorganised and during the successive plan periods, the functional base of BSI was further expanded to include various new areas such as

- ◆ Inventorising of 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

The objectives of BSI are:

- ◆ 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



Fig 1. Pink Primrose of Valley of flowers

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.
- ◆ Survey, inventurisation and documentation of non-flowering plants.
- ◆ Qualitative and quantitative study of the diversity of selected economically useful species.
- ◆ Develop and maintain botanical gardens, musea and herbaria. and
- ◆ Preparation of Pollen Atlas of Indian Plants.

#### Activities undertaken under various programmes during the year

#### Botanical Exploration and Inventurisation of Phytodiversity

#### Field tours and herbarium consultation tours

Forty-eight field/exploration/live plant collection/EIA Study tours were undertaken by

different circle offices and units of BSI covering Tawang, Dibang Valley & Upper Subansiri 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, Catchments Area of Tsango Lake & Meimanchu Lake and several other districts of Sikkim, Coal mines area of Bilaspur & Sahdol and Rowghat Iron Ore deposit area of Chhattisgarh, Amarakantak region of Madhya Pradesh, Mainpuri, 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 Uttrakhand, Sabarkantha (Himmatnagar) & Amreli districts of Gujarat, Javadi hills of Tamil Nadu, Mangroves area of Kerala, Ferrargunj & Madhuvan forests 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

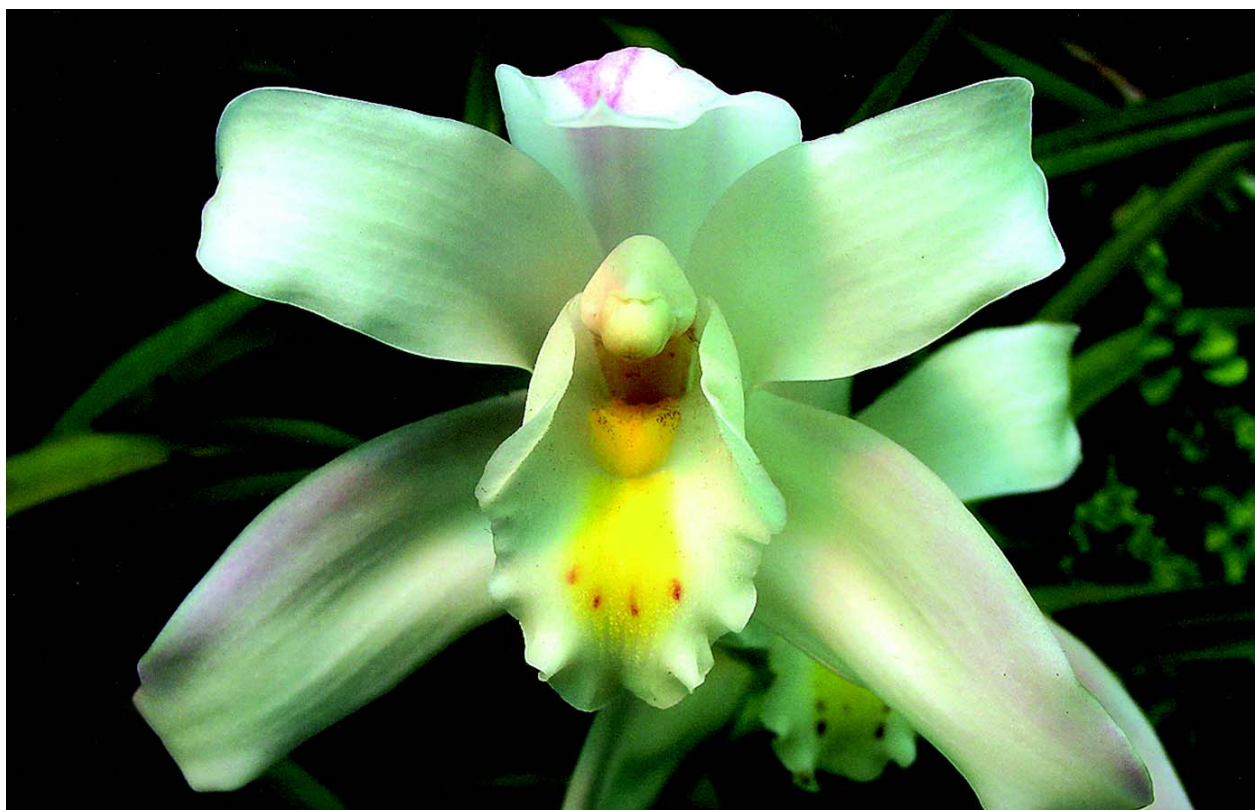


Fig 2. A rich flora (*Cymbidium eburneum*) of West Sikkim



Fig 3. A bed of bright blue Gentian (*Gentiana species*) – an attraction of the valley

specimens have been 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.

Seven herbarium consultation tours/study tours were also undertaken 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, Family Rosaceae and Rubiaceae
- ◆ 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 (Genus: *Oberonia*, *Microstylis*, *Liparis*, *Oreorchis* & *Corallorrhiza*)

#### Documentation of Phytodiversity

##### National Flora (Flora of India)

- ◆ The final manuscript of Flora of India, Volume 23 has been submitted for publication.
- ◆ Polygonaceae: Completed the checklist of 180 species. Detailed taxonomic descriptions of all genera except *Polygonum* are completed.
- ◆ Orchidaceae (Genera – *Oberonia*, *Microstylis*, *Liparis*, *Oreorchis* & *Corallorrhiza* etc): Modification of description and finalization of illustrations has been completed for 35 species of *Liparis* and 20 species of *Oberonia*.
- ◆ Cyperaceae (Genus – *Kyllinga* – 12 spp., *Pycneus* – 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.
- ◆ Orchidaceae (13 genera excluding *Oberonia*, *Microstylis*, *Liparis*, *Orcorchis* & *Corallorrhiza*): Completed studies on 15 species.
  - ◆ Thymelaeaceae (13 genera, 27 species): Completed studies, descriptions and illustrations on *Gonystylus macrophyllus* (Miq.) Airy Shaw and *Diarthron vesiculosum* C. A. Mey.
  - ◆ Loganiaceae (seven genera, 27 species): Manuscript is under preparation.
  - ◆ Acanthaceae (six genera, 50 species): Completed taxonomic description and drawing of one species of *Lepidagathis* and 14 species of *Dicliptera*.
  - ◆ Lauraceae (*p.p.*): 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.
  - ◆ Aphylophorales 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.
- ### State Flora
- ◆ Flora of Mizoram Volume III: Checklist of Monocots of Mizoram is under preparation
  - ◆ Flora of Sikkim (Rosaceae – 110 species, Orchidaceae – 500 species and Rubiaceae – 88 species) Taxonomic description of 43

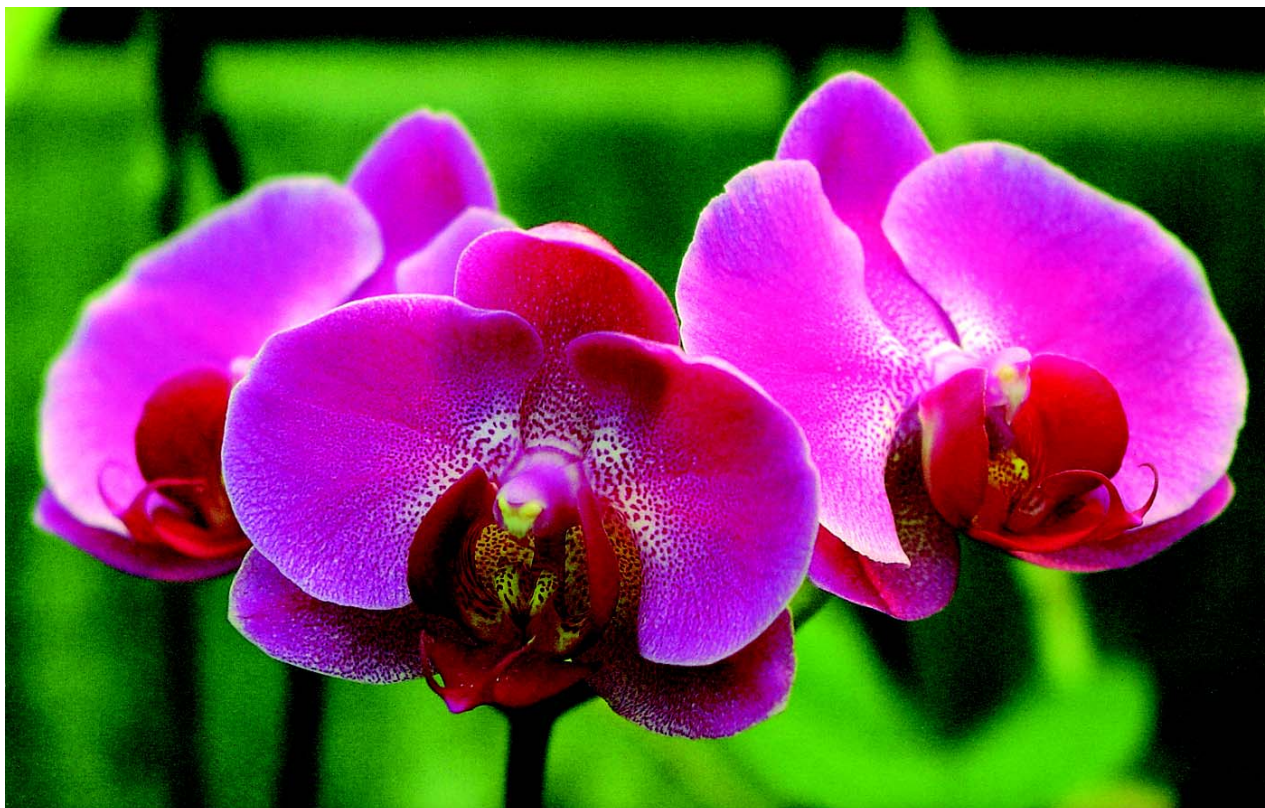


Fig 4. *Phalaenopsis* – an orchid of Sikkim



Fig 5. An orchid (*Dendrobim nobile*) – one of the rhododendrons species

species of Rosaceae, 67 species of Orchidaceae and 88 species of Rubiaceae have been completed during the period.

- ◆ Flora of Uttar Pradesh, Volume I (Mimosaceae): 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 (three species): Taxonomic description of 63 species completed.
  - ◇ Asclepiadaceae – Boraginaceae (57 species), Lamiaceae (64 species), Amaranthaceae (30 species): Taxonomic description of 23 species of Amaranthaceous 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 completed.
- ◆ Flora of Jammu & Kashmir, Volume III:
  - ◇ Myrsinaceae (three genera three spp.), Styracaceae (one genus one spp.), Ebenaceae (one genus three spp.), Oleaceae (six genera 22 spp.), Apocynaceae (10 genera 10 spp.): Manuscript of 34 spp. finalised.
  - ◇ Gnetianaceae (10 genera 34 species), Asclepiadaceae (15 genera 25 species), Loganiaceae (two genera two species): Manuscript of 71 species finalised.
- ◆ Flora of Gujarat, Volume I:
  - ◇ Fabaceae & Caesalpiniaceae (200 species): Prepared key to the genera and species for 64 species belonging to the family Fabaceae and Caesalpiniaceae.

- ✧ Tiliaceae – Moringaceae & Mimosaceae: Prepared key to the genera and species for 178 species belonging to the family Mimosaceae, Tiliaceae, Zygophyllaceae, Geraniaceae, Averrhoaceae, Celastraceae and Moringaceae.
- ✧ Rosaceae – Alangiaceae (200 species): Prepared key to the genera and species for 79 species belonging to family Rosaceae, Onagraceae, Combretaceae, Myrtaceae, Alangiaceae, Molluginaceae, Lythraceae, Haloragaceae, Rhizoporaceae and Apiaceae.
- ◆ Flora of Kerala, Volume II:
  - ✧ Rubiaceae (*ca 240 taxa*): Taxonomic description of 70 species completed.
  - ✧ Nyctaginaceae – Chenopodiaceae (*ca 32 taxa*): Taxonomic description of 30 spp. Completed.
  - ✧ Asclepiadaceae (*ca 80 taxa*): Taxonomic description of 45 spp. under 15 genera completed.
  - ✧ Hernandiaceae – Buxaceae (*65 genera and 184 taxa*): Completed taxonomic description along with keys of 17 species under eight genera belonging to two families.
  - ✧ Convolvulaceae (*ca 80 taxa*): Taxonomic description of eight species completed.
  - ✧ Ulmaceae – Moraceae (*ca 46 taxa*): Taxonomic description of 20 species completed.
  - ✧ Boraginaceae (*ca 17 taxa*): Taxonomic description of 17 species completed.
- ◆ Flora of Andaman & Nicobar Islands, Volume II:
  - ✧ Loganiaceae (three genera nine species): Completed writing of manuscript.
  - ✧ Asclepiadaceae (17 genera 28 species), Moraceae (eight genera 70 species), Nyctginaceae (four genera nine species), Aristolochiaceae (two genera five species), Lamiaceae (eight genera 21 species): Writing of the manuscript of the families Aclepiadaceae, Nyctaginaceae, Aristolochiaceae and Lamiaceae completed.
  - ✧ Piperaceae (two genera nine species), Chloranthaceae (one genera one species), Myristicaceae (four genera 10 species), Monimiaceae (one genera one species): Writing of manuscript of the families Piperaceae, Chloranthaceae and Monimiaceae completed.
- ◆ Flora of West Bengal, Vol. III (*ca 736 spp.*): Editing of families Ebenaceae, Araliaceae, Apocynaceae, Asclepiadaceae, Hydrophyllaceae & Boraginaceae have been completed.
- ◆ Flora of West Bengal, Vol. IV (*ca 736 species*): Editorial checking of families Balanophoraceae, Myristicaceae, Salicaceae has been completed and editorial checking of family Euphorbiaceae is under progress. Taxonomic description of two species of Lamiaceae, six species of Verbenaceae and 16 species of Loranthaceae have also been completed.
- ◆ Flora of West Bengal, Volume V: Completed taxonomic description of four species of Potamogetonaceae, two species of Hydrocharitaceae & 33 species of Poaceae (sub fam. Poideae).
- ◆ Pteridophytic Flora of West Bengal: Manuscript of 54 families belonging to 116 genera and 416 species is under finalisation.
- ◆ Endemic Pteridophytes of West Bengal: Preparation of Rare, Endangered and Threatened (RET) list is completed. All relevant information has been incorporated in the list as per herbarium records. 64 line drawings prepared.

#### *District Floral/Garden Flora*

- ◆ Moss Flora of Tawang District, Arunachal Pradesh: 965 specimens out of collected 1028 specimens have been identified so far.



Fig 6. Asoka (*Saraca asoca*) – its bark and seeds are used in medicine

- ◆ Flora of Barapani Experimental Garden, Shillong: Work completed; Mss typed which includes 156 families, 407 genera & 676 species Final manuscript will be submitted after proof checking.

#### Documentation of Indigenous Knowledge of Plant Resources

- ◆ *Ethnobotanical study of Orissa*: Conducted one tour at Sundergarh district and one tour at Keonjhar district and collected 253 plant specimens having medicinal/food/fodder value.
- ◆ *Plants used in Cosmetics in India*: 60 species (up-to-date nomenclature, family, distribution, photographs, germplasm, uses etc.) have been surfed from internet. Writing work is on progress.
- ◆ Vernacular names, botanical names and local uses of 350 species used five tribes of Arunachal Pradesh have been documented during the period

#### Micropropagation activities and *ex-situ* conservation

Under the Micropropagation activities and *ex-situ* conservation, following activities were constituted:

- ◆ Micropropagation of rare, endangered plants in National Orchidarium & Experimental Botanic Garden, BSI, South Circle, Yercaud.
- ◆ Asymbiotic germination of three orchid taxa viz *Paphiopedilum spicerianum* (Reichb.f.) Pfitz., *P. villosum* (L.)Stein, and *Aerides maculosum* Lindl. were conducted. Seeds were developed into protocorm like bodies after culturing.
- ◆ Micropropagation of *Bentinckia condapanna* Berry ex Roxb were conducted and out of 50 seeds sown, 15 seeds are germinated.
- ◆ Isolation of mycorrhiza was done from the *Paphiopedilum villosum* (L.) Stein and *Phaius tancervilliae* (Banks ex L'Herit) Blume for the symbiotic germination studies.
- ◆ Micropropagation of RET plants of North East India in National Orchidarium & Experimental Botanic Garden, BSI – Eastern Circle, Barapani, Shillong.
- ◆ 210 seedlings of *Michelia doltsopa*, *M. oblonga*, *Exbucklandia populnea*, *Pongomia pinnata*, *Jacaranda mimosifolia*, *Anthocephalus cadampa*, *Grevillea robusta*, etc. planted at EBG, Barapani and 150 seedlings belonging to five genera and species transplanted to different parts of Experimental Botanic Garden, Barapani.
- ◆ Introduced 41 genera and species collected from different parts of NE India.
- ◆ 1500 seedlings and cuttings of *Taxus baccata* were raised.
- ◆ *Nymphaea tetragona* was collected from natural habitat and introduced at BSI, Eastern Circle, Shillong.
- ◆ *Ex-situ* conservation in the Botanic Gardens of BSI





Fig 7. Bramha Kamal (*Saussurea lappa*) – an endangered species

- ✧ The Indian Botanic Garden, Howrah, Botanic Garden of Indian Republic, NOIDA and other Experimental Botanic Gardens of BSI are conserving RET species, Medicinal/Economically important plant species and ornamental species. Cuttings of 86 species have been propagated and seeds of 12 species have been sown in the Mist Chamber of Indian Botanic Garden, Howrah.
- ◆ The following projects under the programme were continued during the year:
  - ✧ Isolation of flavanoids from *Bauhinia* plants and its contribution to the chemotaxonomy of the family Leguminosae
  - ✧ Phytochemical investigations of endangered plant species in India including Negative List of Export and their biological assessment
  - ✧ Pharmacognostic Studies on the selected plants of the Negative list of Export.
- ◆ **Other Activities**
  - ◆ Woodland Development programme of Botanic Garden of Indian Republic, NOIDA
    - ✧ About 650 seedlings belonging to about 35 species were introduced in the peripheral of woodland of the garden. A separate Ficus arboretum has been developed by introducing 5 species of Ficus. About 250 seedlings were replaced in southern section of the woodland. A new arboretum of dry deciduous Gangetic hill forest ecosystems developed in the eastern section of the woodland. About 120 seedlings belonging to about 8 species were also introduced in the northern section of the woodland towards the development of a representative dry deciduous mixed arboretum.
  - ◆ Development of databases
    - ✧ Development of databases on 'Fibre Bay', 'Medicinal Bay', 'Dyes and Tans Bay', 'Food, Fodder & Beverage Bay'

- and 'Oil & Oilseeds Bay' were carried out in Industrial Section in Kolkata.
- ✧ Databases on trees of India, data of introduced plant and Indian Pteridophytes were developed in BGIR, NOIDA.
  - ◆ Enrichment of Library
    - ✧ Six hundred and forty nine Indian Journals, 548 foreign journals, 49 departmental and 335 other institutional reports/newsletters/brochures and 956 books were incorporated in the libraries of BSI throughout India.
  - ◆ Maintenance of Herbaria
    - ✧ Various specimen maintained in the Herbaria of BSI is given in the Table-1.
  - ◆ Pharmacognostic Study
    - ✧ Nineteen crude drug samples received from Customs Authorities have been pharmacognostically studied, identified and authenticated. Materials have been collected and computerized for the preparation of 'A Manual of CITES plants in India (Negative List of Export)'.
  - ◆ *Penkimia nagalandensis* Phukan & Odyuo [Orchidaceae]
  - ◆ *Lycoperdon ovalicaudatum* D. Bisht, J. R. Sharma & Kreisel [Lycoperdaceae] – Fungi
  - ◆ *Russula mayawatiana* K. Das, S.L. Mill & J.R. Sharma [Russulaceae] – Fungi
  - ◆ *Russula dhakuriana* K. Das, S.L. Miller & J.R. Sharma [Russulaceae] – Fungi
  - ◆ *Russula appendiculata* K. Das, S.L. Miller & J.R. Sharma [Russulaceae] – Fungi
  - ◆ *Russula mukteshwarica* K. Das, S.L. Miller, J.R. Sharma & R.P. Bhatt [Russulaceae] – Fungi
  - ◆ *Russula puellaris* var. *atrii* K. Das, S.L. Miller & J.R. Sharma [Russulaceae] – Fungi
  - ◆ *Russula amoenicolor* Rom. var. *ramgarhensis* K. Das, J. R. Sharma & R.P. Bhatt [Russulaceae] – Fungi
  - ◆ *Russula flavida* Frost. var. *dhakurianus* K. Das, J. R. Sharma & R.P. Bhatt [Russulaceae] – Fungi
  - ◆ *Lactarius dhakurensis* J. R. Sharma & K. Das [Russulaceae] – Fungi

**Special information**

Twentythree New Species/Variety discovered

**Table-1. Maintenance of Herbaria in Botanical Survey of India**

No. of Specimens mounted (Lower & Higher Groups)	10484
No. of Specimens remounted	5471
No. of Herbarium sheets Stitched/labeled	9517
No. of Herbarium sheets dusted/fumigated	19080
No. of specimens poisoned	10807
No. of Genus cover/species cover changed	2420
No. of Specimens incorporated	4683
No. of Specimens sent on loan	117
No. of Specimens received on exchange/loan	292
No. of cibachromes received from Kew	39 (Incl. 7 Holotype, 1 Isotype, 1 Iso-syntype)
No. specimens received on gifts	146
No. of species identified	3118
No. of Herbarium sheets accessioned	3928

- ◆ *Leptopus sanjappae* Sumathi, Karthigeyan, Jayanthi & Diwakar  
[Euphorbiaceae]
- ◆ *Dasya ulhasii* Sonali U. Jadiye & P.S.N. Rao  
[Dasyaceae] – Algae
- ◆ *Hygrophila schulli* (Hamilton) Almeida & Almeida var. *alba* Parmar, P. J.  
[Acanthaceae]
- ◆ *Streblochaete sanjappae* K.A.A. Kabeer & V.J. Nair  
[Poaceae]
- ◆ *Eugenia shettyana* C. Murugan & R. Gopalan  
[Myrtaceae]
- ◆ *Euonymus barberi* C. Murugan & V.S. Manickam  
[Celastraceae]
- ◆ *Polypogon nilgiricus* Kabeer, K.A.A. & Nair, V.J.  
[Poaceae]
- ◆ *Symplocos authilingomii* A.N. Henry & R. Gopalan  
[Symplocaceae]
- ◆ *Asystasia indica* H. J. Chowdhery & A. Bhattacharya  
[Acanthaceae]
- ◆ *Zeuxine pantlingii* H. J. Chowdhery & A. Bhattacharya  
[Orchidaceae]
- ◆ *Cheirostylis chinensis* Rolfe var. *glabra* M. Bhaumik & M. K. Pathak  
[Orchidaceae]
- ◆ *Stellaria pinvalliaca* S. K. Srivastava & K. Chandrasekhar  
[Caryophyllaceae]
- ◆ *Lopholejeunea sikkimensis* var. *tenuicostata* Sushil K. Singh et D.K. Singh  
[Lejeuneaceae] – Hepaticae
- Twenty five New Records for India**
- ◆ *Carex echinata* Murray  
[Cyperaceae]
- ◆ *Cryptothecia granularis* Sipman  
[Cryptotheciaceae] – Lichens
- ◆ *Pyrenula acutalis* R. C. Harris  
[Pyrenulaceae] – Lichens
- ◆ *Pyrenula pseudobufoina* (Rehm.) R. C. Harris  
[Pyrenulaceae] – Lichens
- ◆ *Pyrenula subelliptica* (Tuck.) R. C. Harris  
[Pyrenulaceae] – Lichens
- ◆ *Physcia manuelii* Moberg  
[Physciaceae] – Lichens
- ◆ *Trypethelium ceylonicum* Makhija & Patwardhan  
[Trypetheliaceae] – Lichens
- ◆ *Physcia lobulata* Moberg  
[Physciaceae] – Lichens
- ◆ *Physcia stellaris* (L.) Nyl.  
[Physciaceae] – Lichens
- ◆ *Phaeophyscia spinulosa* Kashiw.  
[Physciaceae] – Lichens
- ◆ *Physconia distorta* (With.) J. Laundon  
[Physciaceae] – Lichens
- ◆ *Eria extintoria* (Lindl.) Oliv.  
[Orchidaceae]
- ◆ *Calvatia longicauda* (Henn.) Lloyd  
[Lycoperdaceae] – Fungi
- ◆ *Vascellum endotephrum* (Pat.) Demoulin & Dring  
[Lycoperdaceae] – Fungi
- ◆ *Lactarius lignyotus* Fr. var. *canadensis* Sm. & Hesler  
[Russulaceae] – Fungi
- ◆ *Memecylon gracillimum* Alston  
[Melastomataceae]
- ◆ *Memecylon leucanthemum* Thwaites  
[Melastomataceae]
- ◆ *Memecylon rostratum* Thwaites  
[Melastomataceae]
- ◆ *Memecylon royenii* Blume  
[Melastomataceae]
- ◆ *Clinacanthus nutans* (Burm.f.) Lindau  
[Acanthaceae]

- ◆ *Liparis elegans* Lindl. [Orchidaceae] ◆ *Strychnos rupicola* Pierre ex Don [Loganiaceae] – Andaman & Nicobar Islands
- ◆ *Salvia reflexa* Hornem [Lamiaceae] ◆ *Boerhavia procubens* Banks ex Roxb. [Nyctaginaceae] – Andaman & Nicobar Islands
- ◆ *Oxytropis hypoglottoides* (Baker) Ali [Leguminosae] ◆ *Trias oblonga* Lindl. [Orchidaceae] – Andaman & Nicobar Island
- ◆ *Gaultheria brevistipes* (C. Y. Wu & T. Z. Hsu) R. C. Fang [Ericaceae] ◆ *Agrostistachys indica* Dalzell [Euphorbiaceae] – Goa
- ◆ *Hemiorchis rhodorrhachis* Schum. [Zingiberaceae] ◆ *Calophyllum polyanthum* Wallich ex Choisy [Clusiaceae] – Goa
- ◆ *Cottonia peduncularis* (Lindl.) Rchb.f. [Orchidaceae] – Goa
- Forty one New Record for State**
- ◆ *Heterodermia lamelligera* (Tayl.) Follmann & Redon [Physciaceae] – West Bengal (Lichens) ◆ *Erigeron sublyratus* DC. [Asteraceae] – Goa
- ◆ *Ricciocarpus natans* (L.) Corda [Ricciaceae] – West Bengal (Hepaticae) ◆ *Evolvulus nummularius* (L.) L. [Convolvulaceae] – Goa
- ◆ *Hemiorchis rhodorrhachis* Schum. [Zingiberaceae] – West Bengal ◆ *Hedyotis trinervia* (Retz.) Roem. & Schult. [Rubiaceae] – Goa
- ◆ *Porina subsanctirosae* Makhija et al. [Trichotheliaceae] – Assam (Lichens) ◆ *Hygrophila ringens* (L.) Steudel [Acanthaceae] – Goa
- ◆ *Strigula hypothallina* R. C. Harris [Trichotheliaceae] – Assam (Lichens) ◆ *Memecylon terminale* Dalzell [Melastomaceae] – Goa
- ◆ *Alternanthera philoxeroides* (Mart.) Griseb. [Amaranthaceae] – Maharashtra ◆ *Pajanelia longifolia* (Willd.) K. Schum. [Bignoniaceae] – Goa
- ◆ *Polysiphonia unquiformis* Boergesen [Dasyaceae] – Algae ◆ *Phaulopsis imbricata* (Forssk.) Sweet [Acanthaceae] – Goa
- ◆ *Mastixia euonymoides* Prain [Cornaceae] – Tamil Nadu ◆ *Schumannianthus virgatus* (Roxb.) Rolfe [Maranthaceae] – Goa
- ◆ *Pavetta siphonantha* Thwaites [Rubiaceae] – Tamil Nadu ◆ *Scilla hyacinthina* (Roxb.) J.F. Macbr. [Hyacinthaceae] – Goa
- ◆ *Pavetta travancorica* Bremek. [Rubiaceae] – Tamil Nadu ◆ *Strobilanthes ciliatus* Nees [Acanthaceae] – Goa
- ◆ *Tarenna trichurrensis* Sasidh. & Sivar. [Rubiaceae] – Tamil Nadu ◆ *Syzygium laetum* (Buch.-Ham.) Gandhi [Myrtaceae] – Goa
- ◆ *Eulophia zollinger* (Reichb. f.) J. J. Smith [Orchidaceae] – Andaman & Nicobar Islands ◆ *Tolypanthus lagenifer* (Wight) Tiegh. [Loranthaceae] – Goa
- ◆ *Erythrochis altissima* (Bl.) Bl. [Orchidaceae] – Andaman & Nicobar Island ◆ *Viscum monoicum* Roxb. ex DC. [Viscaceae] – Goa
- ◆ *Zanonia indica* L. [Cucurbitaceae] – Goa

- ◆ *Antistrophe serratifolia* (Bedd.) Hook. f.  
[Myrsinaceae] – Karnataka
- ◆ *Arundinella mesophylla* Nees ex Steud.  
[Poaceae] – Karnataka
- ◆ *Biophytum nervifolium* Thwaites  
[Oxalidaceae] – Karnataka
- ◆ *Boiphytum nudum* Edgew. & Hook. f.  
[Oxalidaceae] – Karnataka
- ◆ *Cucurbita moschata* (Duchesne ex Lam.)  
[Cucurbitaceae] – Karnataka
- ◆ *Cuscuta chinensis* Lam.  
[Cuscutaceae] – Karnataka
- ◆ *Elatine triandra* Schkuhr  
[Elatinaceae] – Karnataka
- ◆ *Ipomoea sindica* Stapf  
[Convolvulaceae] – Karnataka

#### Nine Plants collected after 50 years or more

- ◆ *Begonia tessaricarpa* C. B. Clarke  
[Begoniaceae]
- ◆ *Cistachne tubulosa* (Schrenk) Wight  
[Orobanchaceae]
- ◆ *Euonymus paniculatus* Wight ex Lawson  
[Celastraceae]
- ◆ *Syzygium beddomei* (Duthie) Chithra  
[Myrtaceae]
- ◆ *Psychotria beddomei* Deb & Gangp.  
[Rubiaceae]
- ◆ *Strobilanthes papillosus* T. Anderson  
[Acanthaceae]
- ◆ *Cicerbita filicina* (Duthie ex Stebbins)  
Mamgain & Rao  
[Asteraceae]
- ◆ *Arisaema sarracenioides* E. Barnes & C.E.C.  
Fisch.  
[Araceae]
- ◆ *Fimbristylis aggregate* C.E.C. Fisch.  
[Cyperaceae]
- ◆ Publications
  - ◇ A total number of 117 research papers

and abstracts were published in various Indian and foreign journals during the year.

- ◇ The following books and journals / bulletins were published:
  - ★ Flora of Hazaribagh District, Vol. 2;
  - ★ Biodiversity of Desert National Park;
  - ★ *Strobilanthes*, Blume.;
  - ★ Fascicles to the Flora of India, Vol. 23;
  - ★ Key works of the Floristics of India, Volume 2;
  - ★ वनस्पति वाणी Volume 15 (non priced); and
  - ★ Bulletin of BSI, Volume 47.

#### Survey of Fauna

##### Zoological Survey of India

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. ZSI with its headquarters at Kolkata and 16 Regional Stations located in different parts of the country, in recent years, has reoriented its plan of work by grouping the survey and studies under five 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.

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

##### Activities undertaken during the year

One hundred and one extensive faunal



Fig 8. Common Wanderer (*Pareronia valeria*), of Uttarakhand

surveys were undertaken to different States/Union Territories including important ecosystems and some selected conservation/protected areas. Four status surveys one for Tibetan Wild Ass (Kiang) in Ladakh, one for Himalayan Marmot in Ladakh, one for Snow Trout in Himachal Pradesh and another for Himalayan Salamander in West Bengal were carried out. One environment impact assessment survey at Rowghat of Bhilai Steel Plant in Orissa was conducted. 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 also continued.

The National Zoological Collection was further enriched by the addition of 9532 Identified specimens belonging to 487 species. In addition to above major activities, Identification and Advisory Services were rendered to 84 individuals or institutions in India and abroad. Three training courses were organised under Training and

Extension Programme. The ZSI scientists also participated in the training courses/meetings abroad.

Publications brought out during the year includes two volumes (eight parts) of the periodical Records of Zoological Survey of India, 10 occasional papers, two volumes of Memoirs of ZSI, 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, one Annual Report, three documents of Handbooks and Pictorial Guides and four special publications.

## Faunal Explorations and Surveys

### Ecosystems

#### Wetlands

A total of 14 extensive surveys, 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),



Fig 9. An Openbill Stork at its habitat

Chauras of Ganges River in North Bihar, Asan barrage in Uttarakhand State, Nal-Sarovar and Khijaria lake in Gujarat were conducted.

#### Deserts

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



Fig 10. Ghataputra fresh water ecosystem

#### 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 Area

##### Biosphere Reserve

One survey to Achanakmar in Chhattisgarh State was carried out.

##### National Parks

A total of 10 surveys, two to Bandhavgarh in Madhya Pradesh, one to Bannerghata in Karnataka, one to Dibru-Saikhowa in Assam, one to Kangerghati in Chattisgarh, two to Kudremukh in Karnataka, two to Pench in Maharashtra and one to Ranthambhore in Rajasthan were carried out.

## 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 Reserve

Three surveys, one to Corbett in Uttarakhand 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, Assam, Goa, Gujarat, Himachal Pradesh, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Mizoram, Nagaland, Rajasthan, Tamil Nadu, Tripura and Uttarakhand.

## Ecological/Status Survey

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

## EIA Survey

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

## Research Work

### Identification of New Taxa

During the year following taxa were discovered as new to India

Phylum - Arthropoda  
Class - Insecta  
Order - Hymenoptera  
Family - Pteromalidae  
*Panstenon oxylus* (from Orissa)

Phylum - Nematelminthes  
Class - Nematodaa  
Order - Rhabditida  
Family - Plectidae  
*Plectus elongatus* (from Rajasthan)

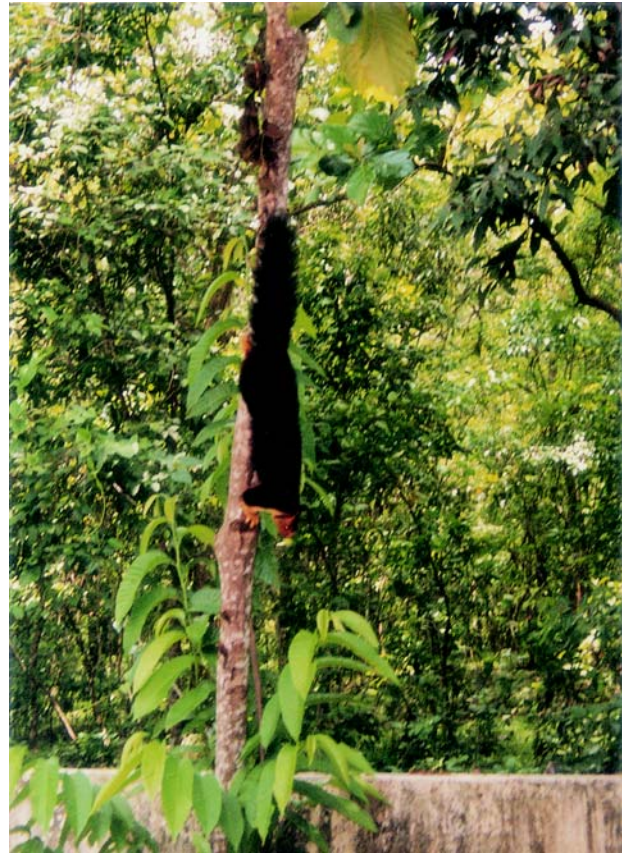


Fig 11. Indian Giant Squirrel (*Ratufa indica*) at Periyar Tiger Reserve, Kerala

Family - Cephalobidae  
*Acrobelloides bodenheimeri* (from Rajasthan)

Order - Alaimida  
Family - Alaimidae  
*Alaimus arcuatis* (from Rajasthan)

Order - Dorylaimida  
Family - Tylencholaimidae  
*Tylencholaimus terrestris* (from Rajasthan)

Family - Nygolaimidae  
*Nygolaimus hyans* (from Rajasthan)

Family - Aporcelaimidae  
*Aporcelaimellus clamus* (from Rajasthan)

## Taxonomic Studies

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



## 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 recognized.

### Assam

One hundred and forty eight specimens belonging to 46 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 and nine specimens belonging to seven species of Mantodea were studied.

### Gujarat

Eighty five specimens belonging to 16 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

Two hundred and seventy nine specimens belonging to 25 species of Fishes and 59 specimens belonging to 17 species of Reptiles, 33 specimens belonging to 21 species of Odonata and 54 specimens belonging to nine species of Hemiptera were studied and identified.

### Kerala

Three specimens comprising two species of Mammals, 11 specimens belonging to five species of Reptiles, 59 specimens belonging to 16 species of Amphibia and 388 specimens comprising 65 species of Fishes were identified.

### Madhya Pradesh

Forty four specimens belonging to 17 species

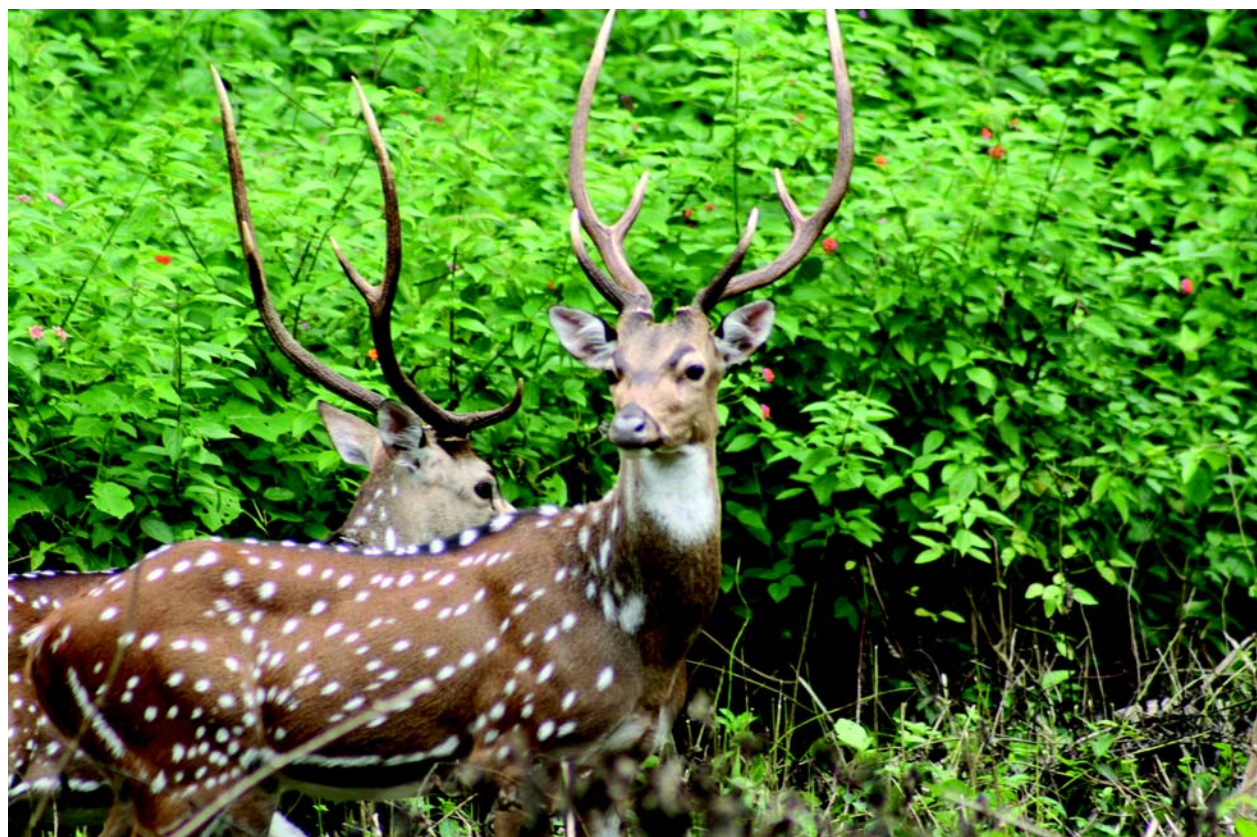


Fig 12. Spotted deer, commonly known as 'Chital'



Fig 13. Sambar (*Cervus unicolor*) at Bar Noapara Wildlife Sanctuary, Chhattisgarh

of Odonata, four specimens comprising two species of Crustacea, 119 specimens comprising 23 species of Arachnida and two specimens belonging to one species of Chilopoda were recognized.

#### Maharashtra

Twenty six specimens belonging to six species of Mammals, 194 specimens comprising 55 species of Fishes, 44 specimens belonging to 13 species of Molluscs, 336 specimens comprising 11 species of Arachnida and 136 specimens belonging to 25 species of Thysanoptera were identified.

#### 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 recognized.

#### Meghalaya

Five hundred and eighty five specimens comprising of 57 species of Fishes, 148 specimens

comprising of 20 species of Amphibia, 15 specimens belonging to 11 species of Reptiles and 91 specimens belonging to 44 species of Lepidoptera were identified.

#### Mizoram

Forty eight specimens belonging to 11 species of Amphibia, seven specimens belonging to five species of Reptiles and 50 specimens comprising 21 species of Fishes were recognized.

#### Nagaland

One hundred and twenty seven specimens comprising of 23 species of Fishes and 55 specimens belonging to 19 species of Reptiles were identified.

#### Rajasthan

Forty two specimens belonging to 14 species of Nematodes, 45 specimens belonging to 17 species of Isoptera, 82 specimens comprising of 16 species of Hymenoptera and 132 specimens comprising 30 species of Coleoptera were recognized.

### Tamil Nadu

One hundred and forty two specimens comprising of 14 species of Fishes, 28 specimens belonging to four species of Crustacea, 16 specimens belonging to two species of Mollusca and 47 specimens comprising of 22 species of Mantodea were identified.

### Tripura

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

### Uttarakhand

Forty six specimens belonging to 18 species of Lepidoptera, 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 was identified.

## Fauna of Conservation Areas

### Biosphere Reserves

#### Achanakmar (Chhattisgarh)

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

### National Parks

#### Bandhavgarh (Madhya Pradesh)

Twenty three specimens belonging to six species of Arachnida and 109 specimens comprising 32 species of Lepidoptera were studied and determined.

#### Bannerghata (Karnataka)

Four hundred and 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 eight species of Coleoptera and 26 specimens consisting of two species of Arachnida 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 and 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, 28 specimens belonging to 13 species of Mollusca, 124 specimens belonging to eight species of Arachnida and 53 specimens belonging to nine species of Crustacea were studied and determined.

#### Kumbhalgarh (Rajasthan)

One hundred and ninety eight specimens belonging to 16 species of Coleoptera 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)

As a result of studies conducted on the



Fig 14. Gaur (Indian Bison) at Bandipur National Park

zooplankton diversity of seven perineal and ephemeral flood plain lakes of this sanctuary, 18 specimens of Rotifera belonging to 10 species were recognised.

#### Simbalwara (Himachal Pradesh)

Thirteen specimens belonging to 10 species of Reptilia, one specimen belonging to one species of Mammal, 23 specimens belonging to six species of Amphibia, 21 specimens belonging to eight species of Fishes, 48 specimens belonging to 25 species of Lepidoptera and 107 specimens belonging to 27 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

#### Corbett (Uttar Pradesh)

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, 211 specimens belonging to 13 species of Coleoptera, 16 specimens belonging to two species of Hymenoptera and 32 specimens belonging to seven species of Nematodes were recognized.



Fig 15. A white breasted Kingfisher in search of prey



Fig 16. Rosy Pelican (*Phoenicopterus roseus*) in its habitat at Bhuj wetlands, Gujarat

### Fauna of Important Ecosystems

#### Freshwater Wetlands

##### Asan Barrage, Uttarakhand

Fifty two species of Avifauna were recorded.

##### Bhoj, Madhya Pradesh

Fifty six specimens belonging to 10 species of Cladocera:Crustacea were studied and determined.

##### 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 identified.

##### Khijaria Lake, Gujarat

Seventy eight species of Avifauna were identified.

##### Nal Sarobar, Gujarat

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

##### Pong Dam, Himachal Pradesh

Thirty six specimens belonging to seven species of Fishes and four specimens belonging to one species of Amphibia were recognized.

##### Flood Plain Lakes, Assam

As a result of studies conducted on zooplankton diversity of flood plain wetlands of this



Fig 17. Red Panda – an endangered species

state, the plankton samples collected from different beels of Kamrup district were analyzed and 54 specimens belonging to 45 species of Rotifera and four specimens pertaining to three species of Cladocera:Crustacea were determined.

#### Estuarine/ Riverine Wetlands

##### Bahuda estuary, Orissa

As a result of studies conducted on the fauna of this estuary 39 specimens comprising 12 species of Fishes were recognised.

##### Vamsadhara-Nagaveli estuary, Andhra Pradesh

Two hundred and fifty eight specimens belonging to 52 species of Molluscs were identified.

##### Beas river, Himachal Pradesh

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

##### Rivers of Kerala

Two hundred and seventy four specimens of

29 species of Fishes were identified.

##### Chauras of Ganges river, Bihar

Two hundred and four specimens of 46 species of Molluscs were identified.

#### Coastal/Marine

##### Shoreline habitats of southern Orissa

Fifty one specimens belonging to 17 species of Hymenoptera, 31 specimens comprising eight species of Diptera, 26 specimens belonging to 16 species of Mantodea and 34 specimens belonging to eight 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.



Fig18. A Leopard resting on a tree branch



Fig 19. Tibetan wild ass (*Equus kiang*) of East Ladakh

#### 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 were recognized.

#### Himalayan

##### 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 15 species of Lepidoptera (Butterflies) were written out.

##### Pictorial Handbook on Amphibians of North-east India

The pictorial handbook is being prepared.

#### Handbook on Mammals of Kerala

The handbook is being prepared.

#### Handbook on Fresh-water Rotifers

The handbook is being prepared.

#### Identification and Advisory Services

The ZSI continued to render identification and advisory services free of cost of 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 132 queries 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 9532 identified specimens pertaining to 487 species.

### Training and Extension

Three training courses on (i) Environmental Awareness and Wildlife Preservation, (ii) Collection, Preservation and Identification of insects and mites of economic importance and (iii) Refresher course in Collection and Preservation Techniques were organized during the year.

### 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 ZSI

- ◆ 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 published
- ◆ Vol. 35 published

### Hand books & 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, *Equus 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).

### Forest Resources and Survey

#### Forest Survey of India, Dehradun

#### Introduction

Forest Survey of India (FSI) is a premier





Fig 20. Semi evergreen deciduous forest, Nilgiri

national organization for Forest Resource Assessment under the Ministry. Besides, carrying out forest and tree cover assessment and conducting field level inventory the organisation is also mandated to build the capacity of Forest Officers of the State Forest Departments in modern survey methods and develop methodologies in this field. Established on June, 1981, the Forest Survey of India succeeded the “Preinvestment Survey of Forest Resources” (PISFR), a project initiated in 1965 by Government of India. Since its creation FSI has been conducting national forest resource assessment on a regular basis and has been trying to keep pace with the advancing technology and to the rapidly changing needs and aspirations of the country. The headquartered FSI is of Dehradun and it has four zonal offices located at Shimla, Kolkata, Nagpur and Bangalore.

### Major activities

The major activities of FSI are:

- ◆ Forest Cover Assessment using remote sensing technology
- ◆ Inventory of Forest areas
- ◆ Inventory of Trees Outside Forests (Rural & Urban)
- ◆ Inventory data processing
- ◆ Methodology design for inventory and forest surveys
- ◆ Training and Extension
- ◆ Projects and consultancies

### Activities and Achievements during the year

#### Forest Cover Assessment

Forest Survey of India (FSI) assesses forest cover of the country every two years by digitally interpretation of remote sensing satellite data and publishes the results in a biennial report called ‘State of Forest Report’ (SFR). Beginning in 1987, nine SFRs have been brought out so far, and the 10<sup>th</sup> SFR is under publication. Starting with data of US Remote Sensing Satellite Landsat for SFR 1987, FSI shifted over to the use of data of the indigenous satellite Indian Remote Sensing (IRS) LISS III sensor since 1995. In the current 10<sup>th</sup> cycle (i.e. for SFR 2005) FSI has used satellite data for IRS P6 Resource sat LISS III having 23.5 meter resolution. It generally takes one and half to two years to process the satellite data for entire country including ground truthing and finalisation of report from the date the satellite data are procured.

#### Inventory of Forest Resources

Inventory of forests and trees outside forests (TOF) is the second major activity of FSI. Forest Survey of India has been conducting field inventory for estimating growing stock and other parameters of the forests since 1965. The inventory of TOF started during 1990s as extensive tree wealth exists outside the forest area.

For comprehensive assessment of forest resources at national level, the country has been divided into 14 physiographic zones and districts are selected as first stage sampling unit. Survey of India toposheet on 1:50,000 scale of the selected districts is divided into 36 grids of 2 ½¢ ‘ 2½’. Further each grid is divided into four sub-grids of 1 ¼¢ ‘ 1 ¼¢ forming the basic sampling units. Two of these sub-grids are randomly selected to form the sample. The entire country is covered in about 1, 71,000 sample points. Separate sampling design is formulated to estimate the growing stock of TOF (Rural) and TOF (Urban). The entire field inventory work is carried out by the zonal offices on the basis of design decided in the headquarters whereas the data processing is done in the headquarters.

During the year data collection and data processing work in respect of forest inventory, TOF (R & U) for 60 districts pertaining to period 2004-06 has been completed. Data collection work in respect of additional 30 districts pertaining to 2006-07 is being done. The inventory provides information on growing stock of wood, diameter and species distribution of trees, regeneration status of forests and biodiversity to some extent and the soil carbon.

### Project Based Activities

#### Inventory of Trees Outside Forests (TOF) in Punjab/ Uttarakhand

On the request of Punjab Forest Department, FSI took up the inventory of Trees Outside Forests in Punjab on a project basis. High resolution remote sensing data was processed to identify the resource on the ground and lay sample plots. The inventory was completed and the report was published during the current year. It has been estimated that total

number of trees in Punjab are 61 million constituting about 20 million Cu.m of wood. The study has also found that Eucalyptus (23.7%), Poplar (21%), *Melia azadirachta* (10.8%), Shisham (10.4%) and Morus (7.5%) are major species in the trees outside forests resource.

FSI has further taken up the inventory of TOF in the current year of selected five districts of Uttarakhand State namely Dehradun, Haridwar, Nainital, Pauri Garhwal and Udham Singh Nagar based on the request of the State government. The inventory, data processing and final report is about to be completed which will provide the available timber resource outside the forests in the state. This is mainly to help the state government to decide issue of license to the wood based industries on the basis of wood assessment.

FSI is also assisting Uttar Pradesh Forest Department in TOF inventory by taking up data processing work. The State Forest Department



Fig 21. Dry deciduous forest, Sathyamangalam

conducted the field measurement of trees outside forests during July/August 2006 and data was subsequently provided to FSI for processing and working out the growing stock of wood and is being completed.

### Forest Cover in Tiger Reserves of India: Status and Changes

A project sponsored by Project Tiger Directorate of the Ministry to study the forest cover status and changes in the 28 Tiger Reserves (TRs) of India using remote sensing technology was completed by Forest Survey of India under which comparison was made between the years 1997 and 2002. The final report titled 'Forest Cover in Tiger Reserves of India: Status and Changes' describing the methodology, maps of forest cover of 1997 and of 2002, the change maps for the period 1997-2002, the respective area figures and a synoptic view of the major findings was released during National Wildlife Board meeting in June 2006. The study

made use of IRS LISS III satellite data pertaining to three years viz., 1997, 2000, 2002 which was used to assess the forest cover status and changes in Tiger Reserves as well as in outer surrounds of 10 km from the boundary of TRs. The key findings are;

- ◆ There is increase in forest cover of five Tiger reserves, a decrease in 11 Tiger reserves and no change in 12 Tiger Reserves with over slight decrease in forest cover.
- ◆ The major loss in forest cover occurred in Nameri, Buxa, Manas, Indravati and Dampa Tiger reserves due to socio-economic reasons and natural disasters.

### National Forest Type Mapping

A project sanctioned by the Ministry under NNRMS (SC-B) involving a two – stage methodology proposes to delineate and map India's forest as per Champion & Seth revised Forest Type



Fig 22. A view of tropical dry deciduous forest, Erode district, Tamil Nadu

classification (1968). The first stage of preparing Forest Type Reference maps with existing information, viz., inventory records available with FSI, thematic maps, forest type maps at 1:2 million scale earlier prepared by FSI, maps of Western Ghat forests prepared by French Institute, Pondicherry, Biodiversity Characterization map by Indian Institute of Remote Sensing (IIRS), Dehradun, WII, Dehradun and State Forest Departments (SFD) stock maps, is complete for all the districts of the country. The second stage involving ground truthing, validation by SFDs and preparation of final maps is under progress.

### Near Real Time Detection of Forest Fires using Satellite data

Forest Survey of India has taken an initiative since November 2004 for the detection and reporting of Forest Fires at national level on near real time basis. The US University of Maryland in collaboration with NASA has developed Rapid Response System using MODIS satellite data for detection of fire across the world. The active fire points detected are put on the web site alongwith the geo-coordinates through Web Fire Mapper. This could be freely down loaded by any one from the website of USA at URL : <http://maps.geog.umd.edu>. FSI downloads the geo-coordinates of forest fire locations during fire season (November to June) daily. These points are then projected on to the forest cover map of India. Location and geo-coordinates of all the active fire points found within forest cover are then listed. This information is disseminated to the concerned State Forest Department. This has helped the State Forest Departments in taking prompt action in controlling the forest fire. The feed back received from the States has revealed that about 90% fire points reported by FSI are correct.

### Monitoring Forest Development Agency (FDA) Plantations

The Ministry launched a National Afforestation Programme (NAP) during 10<sup>th</sup> plan (2002-2007) through the decentralized mechanism of Forest Development Agencies (FDAs) and Joint Forest Management Committees (JFMCs). These plantations are funded by the Ministry. The FSI

has been assigned the task of monitoring the two parameters of the plantations, viz. area coverage and survival percentage of plantations/afforestation on a project basis. The detailed objectives of the project are as follows:

- ◆ To estimate at the national level survival percentage of plantations (species wise) raised by FDAs inside forests and outside forest areas.
- ◆ To assess growth parameters of trees planted under NAP scheme.

Each year 60 FDAs are chosen for monitoring. These FDAs are asked to provide detailed list of plantations/afforestation raised by them under NAP to FSI. Depending upon number of plantations (within and outside forests), 10-15 patches of plantation sites are randomly selected by the FSI at the headquarters for monitoring. The task of monitoring these patches is then given to Zonal Offices of the FSI who lay out sample plots in these plantations and conduct measurements. The monitoring results of 2003-04 and 2004-05 have been analyzed. The area coverage under FDAs at the national level was estimated at 93.29% with 3.79% Standard Error (SE) and the survival percentage was estimated to be 87.58% with 5.33% SE. Similarly the area coverage during 2004-05 indicate an estimate of 97.34% with 2.17% SE. The survival percentage was estimated as 87.23% with 5.02% SE. For 2005-06, 61 FDAs have been selected and monitoring work is being carried out.

### Other Activities

#### FRA 2010 Meeting under 19<sup>th</sup> APFC Session

Forest Survey of India is the nodal organisation of the Government of India to support international organisations like FAO in the endeavour to complete Global Forest Resource Assessment (FRA). FAO completed its Global Forest Resource Assessment 2005 and released its report in early 2006. During 21<sup>st</sup> Session of the Asia-Pacific Forestry Commission (APFC) held at Dehradun in April 2006. FSI hosted FRA 2010 workshop on Future Directions for Forest Resources Assessment in Asia-Pacific Region on 16 April

2006, with an additional session on 19th April at the same venue. Forty-one participants from different countries including 20 National Correspondents on Global Forest Resource Assessment participated. One of the major recommendations of the workshop was that FAO should continue to assist countries in building capacity for collection of reliable forest resources information and other important parameters related to forestry for meeting international and national obligations and also support the establishment of a regional network of FRA National Correspondents in Asia and the Pacific Region.

### **Silver Jubilee Celebrations of Forest Survey of India at Dehradun**

Forest Survey of India celebrated the year 2006 as its Silver Jubilee year on September 28 & 29, 2006. On this occasion a two-day workshop on 'Review of Geomatics in Forest Resource Assessment' was organized. Several senior forest officers from the Central and State Government attended the function. A short film showcasing the history of FSI (then PISFR) and its current activity was released along with a number of publications including Silver Jubilee 'Souvenir, 'Forest Atlas', 'Van Darpan (in Hindi)' and 'FSI Project Overview' at the function. As part of the workshop, senior forest officers, who have had association with FSI, regaled the audience with their experiences of working at FSI. The selected staff and officers of PIS/FSI were also honoured on this occasion.

### **Technical Advisory Committee**

A Technical Advisory Committee (TAC) of Forest Survey of India has been constituted by the Ministry in 2006 to review and advice on various technical activities of Forest Survey of India including forest cover assessment, forest inventory etc and develop road map for future activity. The committee comprises of eminent scientist/foresters and representatives from related institutions like Department of Space, Survey of India, IIRS Dehradun, Statistical organisations, SAC Ahmedabad, IASRI, ICFRE and WII, various state forest departments and the Ministry.

TAC would also lay down the mechanism to develop a national forest spatial database by linking FSI with SFDs.

### **Survey and Utilisation (SU)**

The following programmes / objectives related to forestry sector are dealt by Survey and Utilisation (SU) Division of the Ministry.

### **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.

### **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 NTFP 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.

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.

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 'Certificate Criteria'
- ◆ Committee for 'Certificate Processes'
- ◆ Committee for 'Accreditation Criteria and Process'

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.

### Study of Applied Rates and the Import Duties of Forestry Products for Multi-lateral 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 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 massala/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 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 September 6, 2005, March 9, 2006 and

July 19, 2006 and the Core Group has recommended the forestry items to be included in the 'Sensitive' (Negative) List. The Core Group has also given recommendations for rationalizing the duty structure on forestry items.

### 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.

### Special Achievements during the year

#### 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.

#### 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)
- ◆ 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.
- ◆ Facilitate pilot studies in different forest types of the country to test the Bhopal-India Process and develop replicable models for SFM.
- ◆ Ensure necessary infrastructure, financial and technical support for the proper implementation of the action plan at the national level.
- ◆ **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.

#### ◆ **Uniform Sandal Wood Policy**

Draft All India Policy so prepared for controlling Sandal Wood and Red Sanders' smuggling has been sent to the concerned States of Tamil Nadu, Karnataka, Andhra Pradesh, Kerala and Maharashtra for their comments before taking the views from other States/UTs. As soon as some remaining comments are received, a Uniform Sandal Wood Policy will be finalized for controlling the smuggling of Sandal Wood and Red Sanders after taking the necessary inputs and views from all the States/UTs.

#### ◆ **National Workshop to promote implementation of ITTO Guidelines for Restoration, Management & Rehabilitation of Degraded Tropical Forests**

Ministry of Environment and Forest organized a National level workshop to promote the implementation of International Tropical Timber Organization (ITTO) Guidelines for the Restoration, Management & Rehabilitation of Degraded & Secondary Tropical Forest & Forest Landscape Restoration in India.

The workshop was held on 22 – 25 August 2006 in Chennai. The Participants were from diverse fields including State Forest Departments, especially tropical states,

NGOs, Private Sector, Universities, etc. directly involved in formation and implementation of the policies & strategies pertaining to the subject.

The Workshop recommended that the guidelines for restoration, management and rehabilitation of degraded and secondary tropical forests may suitably be modified to suit the requirements of all the stakeholders in any given landscape in the Indian context; the ITTO – IUCN may consider assisting a pilot project for Forest Landscape Restoration of degraded forests in India; Forest Landscape Restoration (FLR) may be linked with JFM/FDA; guidelines for FLR may be incorporated with Ministry's other guidelines; increased Public-Private-Panchayat Partnership (PPPP) may be encouraged to facilitate and develop FLR Projects.

◆ **ITTO Technical Mission to India**

Within the framework of decision 2(XXIX) of the International Tropical Timber Council (ITTC) entitled "ITTO Objective 2000", the Government of India, through the Ministry of Environment & Forests, submitted an official request to the ITTC in January, 2006 for the visit of a technical mission to India in order to carry out a diagnosis of the forest management status of tropical forests in the country. The objective of the mission was to assist the Government of India "to identify those factors which most severely limit progress towards achieving Objective 2000 and sustainable forest management, and to formulate an action plan to overcome these constraints". The ITTO Objective, 2000 is "sustainable management of tropical forests and transparent trade in tropical timber from sustainably managed resources."

The mission included Maharaj Muthoo (mission leader), Jurgen Blaser (Switzerland, Intercooperation) and John Palmer (United Kingdom, independent consultant) as

international experts, and Dr. Ram Prasad (former director of IIFM) as the Principal National Consultant.

A national multi-stakeholder workshop at Amity University, Noida was also organized on 23<sup>rd</sup> September 2006, where the preliminary findings of the mission were summarized and the National Status Report (NSR) was released by the Hon'ble Minister of State for Environment and Forests.

The workshop came out with the recommendations to: revise the Forest Policy 1988 and related regulatory framework to replace it with an integrated forest policy that considers both, the ecological security and livelihood needs of rural population; forest management policy should clarify the productive role of natural tropical forests; consider the problems identified in the *policies* and *regulations* in respect to the implementation of Joint Forest Management Schemes; review the Forest and Working Plan Codes in view of forest management through JFM and community participatory schemes; promote agreements between JFM schemes and private companies to establish commercial plantations in degraded forest land; strengthen programs and resources for the control of illicit logging and other illegal activities; launch specific programs to support Sustainable Forest Management and establish a *computerized information system* with updated data on forest *product markets* (timber and NTFPs) which will be accessible to producers and buyers of forest products.

◆ **National Seminar of Stakeholders of Forestry Statistics under ITTO project**

The Indian Council of Forestry Research & Education (ICFRE), Dehradun, organized the first National Seminar of Stakeholders of Forestry Statistics on 29-30 November, 2006 in reference to the ITTO funded project, "Establishment of a Network to facilitate Collection, Processing and Dissemination of

Statistics pertaining to Tropical Timber and other Forestry Parameters in India”.

The two day Seminar ended with the final recommendations and inviting comments of Stakeholders and participants. The recommendations included some inclusions and exclusions in the Tables of the “Forest Statistics India”, published biennially by ICFRE, Dehradun. Inclusions which need to be mentioned here are:

- ❖ Table containing data on timber production from area outside forest.
- ❖ Wetlands of the Country.
- ❖ Biodiversity of Indian Forests.
- ❖ Chapter on Medicinal Plants (State wise).
- ❖ Table showing State Tree, State Bird and State Animal.

#### ITTO objectives (as set out in the ITTA, 1994)

- ◆ To provide an effective framework for consultation, international cooperation and policy development among all members with regard to all relevant aspects of the world timber economy;
  - ◆ To provide a forum for consultation to promote non-discriminatory timber trade practices;
  - ◆ To contribute to the process of sustainable development;
  - ◆ To enhance the capacity of members to implement a strategy for achieving exports of tropical timber and timber products from sustainably managed sources by the Year 2000;
  - ◆ To promote the expansion and diversification of international trade in tropical timber from sustainable sources by improving the structural conditions in international markets,
- ◆ by taking into account, on the one hand, a long-term increase in consumption and continuity of supplies, and, on the other, prices which reflect the costs of sustainable forest management and which are remunerative and equitable for members, and the improvement of market access;
  - ◆ To promote and support research and development with a view to improving forest management and efficiency of wood utilization as well as increasing the capacity to conserve and enhance other forest values in timber producing tropical forests;
  - ◆ To develop and contribute towards mechanisms for the provision of new and additional financial resources and expertise needed to enhance the capacity of producing member;
  - ◆ To improve market intelligence with a view to ensuring greater transparency in the international timber market, including the gathering, compilation, and dissemination of trade related data, including data related to species being traded;
  - ◆ To promote increased and further processing of tropical timber from sustainable sources in producing member countries with a view to promoting their industrialization and thereby increasing their employment opportunities and export earnings;
  - ◆ To encourage members to support and develop industrial tropical timber reforestation and forest management activities as well as rehabilitation of degraded forest land, with due regard for the interests of local communities dependent on forest resources;
  - ◆ To improve marketing and distribution of tropical timber exports from sustainably managed sources;
  - ◆ To encourage members to develop national policies aimed at sustainable utilization and conservation of timer producing forests and

their genetic resources and at maintaining the ecological balance in the regions concerned, in the context of tropical timber trade;

- ◆ To promote the access to, and transfer of, technologies and technical cooperation to implement the objectives of this Agreement, including on confessional and preferential terms and conditions, as mutually agreed; and
- ◆ To encourage information-sharing on the international timber market.

#### ITTA, 2006 and India's Participation

- ◆ The 'International Tropical Timber Agreement (ITTA), 1994', successor Agreement to ITTA, 1983 was negotiated in 1994 and came into force on January 1, 1997. As this Agreement is due to expire on December 31, 2006, the new Agreement ITTA, 2006 has been adopted by the member countries on January 27, 2006. India actively participated in the four rounds of Negotiations and contributed significantly towards the finalization and adoption of the new agreement, International Tropical Timber Agreement (ITTA), 2006. The new agreement, International Tropical Timber Agreement (ITTA), 2006 is to be ratified by the member countries before its entry into force, which is in progress.
- ◆ During the year, India also actively participated in the successive International Tropical Timber Council (ITTC) Sessions. The projects entitled "Regional Workshop on Processing, Marketing and Trade of Quality Wood Products of Teak Plantations" submitted by Kerala Forest Research Institute (KFRI), Kerala and "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 Ltd. (TFDPCL),

Tripura have been approved and funded by ITTO during the year.

#### The Andaman and Nicobar Forest and Plantation Development Corporation Ltd. (ANIFPDCL)

Andaman & Nicobar Forest and Plantation Development Corporation Ltd. (ANIFPDCL) is a Government of India Public Sector Undertaking, created in 1997 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 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 December 26, 2004 and it was submitted to the Cabinet Secretariat on December 29, 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.

As per the directions of Cabinet Secretariat, the Cabinet Note has been sent again to A&N Administration and ANIFPDCL for their comments regarding the revival plan through eco-tourism etc. activities vis-à-vis the requirement of staff and expertise for the same.