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भारतीय वनस्पति सर्वेक्षण
BOTANICAL SURVEY OF INDIA

BOTANICAL SURVEY OF INDIA
Ministry of Environment, Forest & Climate Change

ANNUAL REPORT 2014-2015

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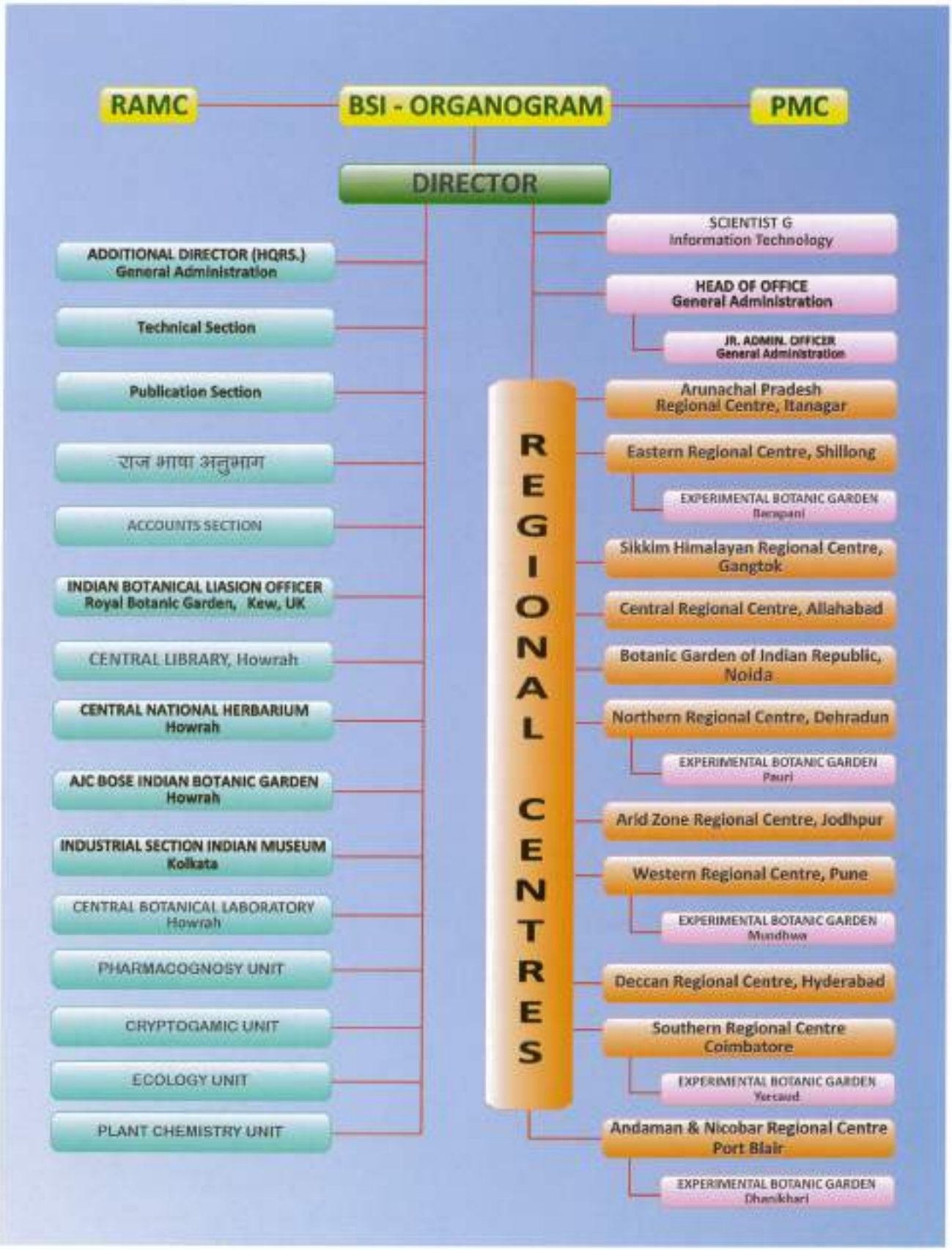
CONTENTS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Sikkim Himalayan Regional Centre,
Gangtok
Central Regional Centre, Allahabad
Botanic Garden of Indian Republic,
Noida
Northern Regional Centre, Dehradun
EXPERIMENTAL BOTANIC GARDEN
Pauri
Arid Zone Regional Centre, Jodhpur
Western Regional Centre, Pune
EXPERIMENTAL BOTANIC GARDEN
Mandhwa
Deccan Regional Centre, Hyderabad
Southern Regional Centre
Coimbatore
EXPERIMENTAL BOTANIC GARDEN
Yercaud
Andaman & Nicobar Regional Centre
Port Blair
EXPERIMENTAL BOTANIC GARDEN
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From the Director's Desk.....

It is a great pleasure for me to present the Annual Report of Botanical Survey of India for the financial year 2014-2015. The report embodies brief account of the all-round progress made by the Institute in its survey, research, development, technological extension and outreach activities.

During the period 2014-2015, Botanical Survey of India excelled in a broad spectrum of disciplines in basic as well as applied plant sciences. In this period, the Institute carried out 123 field trips under 138 projects (including 04 Funded Projects) for collection of plant specimens/materials for floristic, conservation, ethnobotanical and pharmacognostic studies of flowering and non-flowering plants of three biodiversity hotspots, viz. the Himalaya, the Indo-Burma and the Western Ghats-Sri Lanka. Extensive floristic survey was conducted in a wide range of biogeographical regions including protected areas, fragile ecosystems and sacred groves during which a total of 13595 field numbers were collected of which 7939 were identified and documented. Revisionary studies on the family Bignoniaceae,genera *Lepisorus*, *Adiantum*, *Fimbristylis*, subtribe *Sporobolinae* (Poaceae) under National flora and family Gesneriaceae, genus *Impatiens* (Balsaminaceae), family Polypodiaceae under regional flora were carried out. Ethnobotanical information gathered from Dang District of Gujarat and Nayagarh, Malkangiri, Naupada, Boudh and Balasore Districts of Odisha and documented. During this period, scientists of Botanical Survey of India discovered 01 new genus, 52 new species, 10 new infra-specific taxa from India while new geographical records of 02 new genera, 47 species and 02 subspecies were reported for the first time for India. The botanic gardens of Botanical Survey of India

were actively engaged in introduction, enrichment, conservation, propagation and multiplication of RET plant species, botanical curiosities, orchids, ornamentals, ferns, medicinal plants, etc. Digital phyto-mapping of shrubs and trees of AJC Bose Indian Botanic Garden was initiated with the aid of GIS technique. Rattans & bamboos, wild gingers, other economically important tree species were also introduced for *ex-situ* conservation.

In order to develop digital 'Indian Plant Diversity Information System (IPDIS)', Botanical Survey of India has initiated the process of web launching of all of its publications (books, records, periodicals, newsletters, reports etc.), archival correspondences (Wallich, Roxburgh, Hooker, etc.) and rare books (even not available in any of the Biodiversity library portal). Under this scheme, development of 'Flora of India' and 'Checklist of Indian Plants' databases have also been initiated.

The period also witnessed 125th year of Botanical Survey of India during which a series of scientific lectures by experts were organized by the Institute at Ashutosh Centenary Hall of Indian Museum, ISIM and other regional centres. As a part of this, a booklet on '125 years of Passion for Plants' was released by Hon. Secretary, MOEF & CC.

In recognition of outstanding contribution in the field of plant systematics, scientists of the Institute were honoured with National Awards and recognitions by various professional bodies.

I take this opportunity to congratulate and thank all my colleagues for the sincere efforts they made in fulfilling goals and targets of the Institution and for maintaining the legacy of Botanical Survey of India as the apex research organization under the Ministry of Environment, Forests & Climate Change, Govt. of India for carrying out taxonomic and floristic studies on wild plant resources of the country through Survey, Documentation and Conservation.

(PARAMJIT SINGH)

Introduction

Taxonomy is core to and an integral part of the conservation and sustainable utilisation of biological diversity. For devising effective conservation and management strategies, it is a prerequisite to know what to conserve, where and how to conserve, and what their characters are and how are they related. These questions are answered by specialists known as taxonomists.

India has been on the forefront of taxonomic studies right from the late 18th century. British used India as one of the nodes of global network, for exploration and introduction of plants, especially from south and south-eastern Asian countries. By the end of the 19th century, botanical studies were conducted by the Government of the Bengal, Bombay and Madras Presidencies and the North-Western Provinces through their botanical departments in the gardens at Shibpur, Poona, Madras and Saharanpur. They realised the importance of taxonomic studies for exploration of biological wealth of India and need for establishment of national institute dedicated to plant taxonomy, introduction and conservation of plants. Sir George King, who took charge of the Royal Botanic Garden, Calcutta in 1871, was instrumental in procuring a new building, built exclusively for the herbarium in 1882.That effectively sowed the seeds of Botanical Survey of India subsequently. A proposal for organising a Survey was put forth before the Government, and in July 1887, the Secretary of State for India approved it. On 13th February 1890 a Survey was formally constituted and designated as the Botanical Survey of India.

Brief History

The Botanical Survey of India has been engaged in exploring, identifying and documenting rich plant resources of the country. Sir George King, who was the then Superintendent of the Royal Botanical Garden, Calcutta (now rechristened as Acharya Jagadish Chandra Bose Indian Botanical Garden), became the first Director of the Botanical Survey and was holding the dual charges of Garden and the Survey. A consolidated flora of the Indian subcontinent had been published under the leadership of Sir J.D.Hooker between 1872 and 1897. The Survey flourished for about half a century and generated both material base and literature for taxonomic research. Subsequent to the retirement of C.C. Calder in 1939, the Survey turned quiescent till 1953. After independence, Dr. E.K. Janaki Ammal was appointed as Officer on Special duty by Government of India in 1952, for revival of Botanical Survey for building the much desired inventory of the country's rich plant resources. The reorganisation plan, submitted by her was approved in1954 and the Survey was revitalised with focus to undertake intensive exploration surveys, to document the plant resources in the form of Local District, State and National Floras, to act as a custodian of authentic collections in herbaria and to assist educational and research institutions in authentication of specimens on which they work on and in the advancement of taxonomic research for the cause of plant conservation and sustainable utilisation.

Present Spread and glimpses of Regional Centres

Headquarters: Apart from the Directorate, the Headquarter consists of Flora Cell, Cryptogamic Section, Palynology Section, Central Library, Publication Section, Technical Section, Pharmacognosy Section, Ecology and Plant Chemistry Section. The Central library is with about 54,000 accessioned books and subscribes more than 62 National and International journals. The Pharmacognosy Section possess about 700 crude drug samples, while Cryptogamic section has more than 70,000 specimens of Pteridophytes, 5,000 of mosses, 2,000 of liverworts, 4,500 fungi, 3,000 lichens and 1,500 algal specimens.

AJC Bose Indian Botanic Garden, Howrah: AJC Bose Indian Botanic Garden, established in 1790 by Robert Kyd on the bank of River Hooghly, and formerly known as Indian Botanic Garden, is one of the best landscaped gardens in the world. At present, the garden has an area of 273 acres and is a living repository of more than 14,000 plants belonging to 1,405 species. The garden has 25 different sections with 24 interconnected artificial lakes and recognised as a unique place of learning and has attractions such as the 'Great Banyan Tree: a living wonder in the plant kingdom; the Large Palm House containing rich collection of palms, Including *Lodoicea maldivica* (the Double Coconut Palm); Branching Palm (*Hyphaene thebaica*)

King Lake (named after Sir George King), AJCB
Indian Botanical Garden, Howrah

Kyd Monument at AJCB
Indian Botanical Garden, Howrah

introduced from Egypt; the Century Palm (*Corypha macropoda*); the Giant Water Lily (*Victoria amazonica*) brought from Amazon River; the Queen of flowering trees (Amherstia nobilis), a native of Myanmar; the Mountain Rose or Venezuelan Rose (*Brownea macrophylla*; the Baobab Tree or Kalpavriksh (*Adansonia digitata*), a native of Africa; the Rosogolla Tree (*Chrysophyllum cainio*); The Cannon ball tree (*Couroupita guianensis*); the African Sausage Tree (*Kigelia pinnata*); the Mad Tree (*Pterygota alata*) and the 'Candle Stick Tree' (*Parmenriera cereifera*), are a few to mention. Its germ plasm collections cover Bamboos, Bougainvillea, Citrus, Jasmine, Pandanus, Water Lilies, Palms, and besides a Medicinal Plant Garden.

The Central National Herbarium: The Central National Herbarium (CAL) is one of the oldest and largest herbaria in the world. Presently, the Central National Herbarium possesses about 2.6 million herbarium specimens belonging to nearly 350 families of angiosperms, which are arranged according to Bentham and Hooker's System of Classification. Apart from these collections, good collection of drawings of Indian plants painted by natural dyes and the correspondences among the eminent botanists of that time as archival collections are in possession of CAL. The CAL also has appreciable cryptogamic collections that include fungi, lichens, algae, bryophytes and pteridophytes. It is the hub of taxonomic work of our country serving as a centre for the correct identity including distribution mapping of plants, national reference for literature and specimens to plant taxonomists. It also renders services of varied nature for diverse institutions for the last two centuries. The states of Bihar, Jharkhand and West Bengal come under its jurisdiction, covering an area of 2,62,627 sq. km.

Central Botanical Laboratory : The Central Botanical Laboratory, established on 13th April 1954, is a Centre of research in the field of Ethnobotany and Economic Botany. The laboratory maintains Economic Botany Section with about 6,500 ethnobotanical specimens and its museum with 4233 exhibits.

The Industrial Section, Indian Museum, Kolkata : Established on 1st April 1887, showcase the first-hand information on both wild and cultivated economic plants and plant products of India in eight Bays in the Botanical Gallery of Indian Museum. The Botanical Gallery with about 20,000 exhibits is a repository of diverse collection of economic and useful plant materials, obtained from various phyto-geographical regions of India. The Botanical Galleries attract all age group of visitors for its exhibits and create a general awareness of economic plants and their products of our country, the contributions are essentially made by Sir George Watt. The ledgers and the accompanying herbarium materials are still preserved here. Some rare holdings of Botanical Gallery include *Textile Fabrics of India; Textile manufacturers and embroideries'* and *Fabrics dyed* with Indian dyes'. Sir George Watt's *Agricultural Ledgers* is another noteworthy material which has been great source of data for the publication of the eight volume, *A Dictionary of the Economic Products of India* (1889-1896), which is one of the noteworthy

Regional Centres

The Eastern Regional Centre, Shillong : Concerned with exploration and inventory of the flora of Northeast India, comprising the states of Assam, Manipur, Meghalaya Mizoram Nagaland and Tripura. This Centre's herbarium (ASSAM) has a holding of about 2,60,000 specimens of flowering plants and about 11,000 specimens of non-flowering plants, including about 600 type specimens. The Centre also has a Library, Museum, National Orchidarium and a Tissue Culture Laboratory, besides an Experimental

Nepenthes khasiana Hook. f. : Endemic carnivorous of Khasi hills of Meghalaya

Botanic Garden at Barapani, where a total of 756 species of angiosperms, 13 gymnosperms, 49 pteridophytes and 53 bryophytes of Northeast India are conserved. Some of the noteworthy endemic and threatened plant species such as *Nepenthes khasiana*, *Citrus indica*, *Aquilaria malaccensis*, *Aesculus assamica*, and a large number of Zingibers, Musa and Bamboos are thriving well here.

Western Regional Centre, Pune : The jurisdiction of this regional Centre includes states of Maharashtra, Goa, Karnataka and the Union Territories of Dadra, Nagar Haveli, and Daman Diu. The herbarium (BSI) of the Centre has about 1,33,000 specimens, including 687 type specimens. The collections of this Centre mainly showcase the biodiversity of Western Ghats, including the adjacent regions of Rajasthan, Andhra Pradesh and Kerala. The associated garden at Mundhwa has about 400 species.

Southern Regional Centre, Coimbatore : The Centre covers Kerala, Tamil Nadu and the Union Territories of Lakshadweep and Puducherry. The Centre's herbarium (MH) has more than 2,66,000 specimens, including 2,750 type specimens. The associated garden at Yercaud maintains about 1,100 species that include collections at National Orchidarium.

Northern Regional Centre, Dehra Dun : The Centre covers Chandigarh, Haryana, Himachal Pradesh, Jammu and Kashmir, Punjab and Uttarakhand, including Trans-Himalayan Cold Deserts of Western Himalaya. The

Kedar Peaks, Western Himalaya, Uttarakhand

herbarium (BSD) of this Centre holding about 1,27,000 specimens of flowering plants, including 140 type specimens and 11,300 specimens of non-flowering plants showcasing the vast floristic diversity of the Northwest Himalaya, Indian Cold Desert, Shiwalik and part of Upper Gangetic Plains.The associated gardens at Pauri and Khirsoo maintain the national gymnosperm collections such as *Abies pindrow*, *Cedrus deodara*, *Cupressus torulosa*, *Pinus wallichiana*, *Taxus wallichiana* and species of *Juniperus* and *Taxodium*. A small garden at Dehra Dun facilitates *ex situ* conservation of about 750 endemic, threatened and economically important plant species, including about 70 species of orchids.

Central Regional Centre, Allahabad : The Centre covers Chhattisgarh, Madhya Pradesh and Uttar Pradesh. The herbarium (BSA) of this regional Centre has about 79,000 herbarium specimens, including 4 type specimens. In addition, it houses about 1,700 pteridophytes and 5,000 lichens. The associated garden maintains about 450 species.

Arid Zone Regional Centre, Jodhpur : This Centre was established on18th February 1972 to explore and to carry out floristic studies on plant resources of the arid and semi-arid regions of the North-western India, viz.Rajasthan and Gujarat.The herbarium (BSJO) attached to the Centre has more than 33,500 specimens, including 18 type specimens displaying plant diversity of Rajasthan and Gujarat states. The associated Desert Botanic Garden located in the premise of the regional Centre has more than 250 species of arid region.

Andaman and Nicobar Regional Centre Port Blair : Established at Port Blair on 30th March 1972 with an objective to document the plant diversity of the Andaman and Nicobar Islands. The herbarium (PBL) of the regional Centre has about 32,000 herbarium specimens, including 109 type specimens. Some of the remote areas that were surveyed by the Centre are Saddle Peak National Park, MountThullier, Campbell Bay National Park and little

Mangroove forest at Saddle Peak National Park, Andaman & Nicobar Island

Nicobar Tribal Reserve. The associated Experimental Garden-cum-Arboretum at Dhannikhari maintains about 200 plant species.

Arunachal Pradesh Regional Centre, Itanagar : The Centre is exclusively devoted to the plant-rich Arunachal Pradesh and its herbanum (ARUN) has more than 25,000 specimens of vascular plants, including 22 type specimens, about 1,100 specimens of bryophytes and more than 3,500 specimens of pteriodphytes.The botanic garden, Sankie View, has about 400 species.

Sikkim Himalayan Regional Centre, Gangtok : The Centre is exclusively devoted to the state of Sikkim, and its herbarium (BSHC) has about 45,200 specimens, which include 22 type specimens, besides, there are about 3,700 pteridophytes,1,757 lichens and 215 macrofungi. The associated garden in the campus has about 310 species, mostly orchids from Sikkim.

Botanic Garden of Indian Republic, Noida : Established in 2002 with a mandate to bringing about 35 per cent of the country's wild plant diversity under *ex situ* conservation. The garden is actively engaged in replicating the different forest types of India and also in developing different economic plant sections.

Deccan Regional Centre, Hyderabad : Established in 2005 at Hyderabad, the Centre covers Andhra Pradesh and Odisha. The herbarium (BSID) of this Centre has about 16,400 herbarium specimens pertaining Andhra Pradesh and Odisha states, including about 900 mangrove specimens and about 6,500 Greater Hyderabad specimens. Presently, housed in ZSI premises, the Centre is engaged in exploring the flora of Greater Hyderabad.

OBJECTIVES OF BOTANICAL SURVEY OF INDIA

PRIMARY:

- Exploration, inventorization and documentation of phytodiversity (including non-flowering plants) in general and protected areas, hotspots, fragile ecosystems and sacred groves in particular; publication of National, State and District Floras.
- Identification of Red list species and species rich areas needing conservation; ex situ conservation of critically threatened taxa in botanical gardens.
- Survey and documentation of traditional knowledge (ethno-botany) associated with plants.
- Develop National database of Indian plants, including herbarium specimens, live specimens, botanical paintings, illustrations etc.

SECONDARY :

- Revisionary/Monographic studies on selected plant groups.
- Qualitative analysis of nutritive value of ethno-food plants and other 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, Museum and Herbaria.
- Preparation of Seed, Pollen and Spore Atlas of Indian Plants.

Ficus benghalensis L. (The Great Banyan Tree) located in AJC Bose Indian Botanical Garden, Howrah

RESEARCH PROGRAMME

Research Programme

ANDAMAN AND NICOBAR REGIONAL CENTRE, PORT BLAIR

1. Project : Collection and introduction of seeds and seedlings of 20 tree species, Zingibers, Rattans in the Dhannikhari Experimental Garden-cum-Arboretum (DEGCA), Nayashahar to raise nursery and work on seed germination and phenological survey of tree Species of Dhannikhari Experimental Garden-cum- Arboretum (DEGCA), Nayashahar.

Executing Scientist : Dr. Lal Ji Singh

Date of initiation : 01 April, 2014

Date to be completion : 31 March, 2017

Background of the Project : Information related to the seed germination of tree species which having an immense practical utility in Andaman and Nicobar Islands is lacking. The information of phenology of plants is also critical for a successful management strategy of forest genetic resources. It helps in understanding of the reproductive biology of the species including their association with insects, birds and mammals. There is a need for scientific research in great detail on seed germination, regeneration and management of tree species particularly.

Map showing Andaman & Nicobar Islands

Area and locality of the Allotted Project : Andaman Islands: *c.* 6408 sq. km.

Summary of the work done during 2014-15 : During this period, three field tours in 2nd, 3rd and 4th Quarters were undertaken to North Andaman, Middle Andaman and Little Andaman for collection and introduction of seeds and seedlings of tree species, zingibers and rattans. During field trip 76 photographs were taken and properly identified. As per annual action plan 2014-2015, seedlings/rhizomes/culms of three (03) Rattans & Bamboos, seven (07) plants of Zingiberaceae, twenty six (26) trees and twenty two (22) other valuable taxa were collected from various forest areas of Andaman Islands. All the collected materials were introduced in the Dhannikhari Experimental Garden Cum Arboretum, Nayashahar (DEGCA). The effect of habitats on seed germination of seven (07) tree species [*Albizzia lebbeck* Benth., *Cerbera manghas* L., *Dipterocarpus griffithi* Miq., *Dipterocarpus turbinatus* Gaertn. f., *Garcinia dhanikhariensis* S. K. Srivastava, *Samanea saman* (Jacq.) Merr., *Terminalia manii* King.] was studied. During this period, one herbarium consultation tour w.e.f. 25.02.2015 to 03.03.2015 to CNH, Howrah and BSI, CRC, Allahabad, were also conducted for identification purpose.

Achievements/Outcomes in 2014-15 : *Ex-situ* conservation of several rare, endangered and threatened species of important plant groups of the Islands like, bamboos, canes, orchids, zingibers, pteridophytes, gymnosperms specially living fossil tree: *Cycas* and several forest trees were carried out in the Dhannikhari Experimental Garden-cum-Arboretum. Phenological surveys of 73 tree species of Dhannikhari Experimental Garden cum Arboretum (DEGCA) were documented for the first time.Two separate sections, one for succulent plant and another for aquatic plant diversity

Phoenix andamanensis S. Barrow

Cycas pschannae R. C. Srivast. & L. J.Singh

were designated at DEGCA. The effect of habitats on seed germination and seedling survival of 07 tree species of Andaman and Nicobar Islands have been studied for the first time.

The study also reported one new species *Musa indandamanensis* L. J. Singh (Musaceae), one new generic record for India (*Heterotis* Benth. – Melastomataceae) and one new generic record with a species as an addition to state flora (*Ruellia* L.-Acanthaceae).

2. Project : Lichens of the Nicobar Islands

Executing Scientist : Dr. T.A.M. Jagadeesh Ram

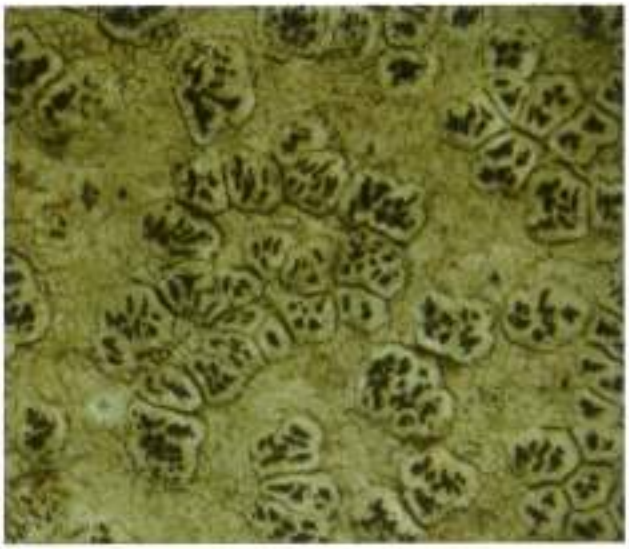
Date of initiation : 01 April, 2014

Date to be completion : 31 March, 2017

Background of the Project : Study of lichen diversity of Nicobar Island.

Area and locality of the Allotted Project : The Nicobar Islands consists of 24 major islands in three main clusters, *viz.* Car Nicobar in the north, Nancowry in the middle and Great Nicobar in the south and covers an area of 1841 sq. km.

Summary of the work done during 2014-15 : Three (03) field tours *w.e.f.* 26.05.2014 to 16.06.2014, 19.09.2014 to 25.09.2014 and 02.12.2014 to 17.12.2014 to Car Nicobar, Camorta, Nancowry, Katchal, Teressa, Trinket, Little Nicobar and Great Nicobar Islands were undertaken. A total of 1541 Field Numbers of plant specimens were collected and all of them were kept in herbarium packets labelled with field data. During these three field tours, 760 photographs were taken and properly identified. Chemical nature of *c.*1200 specimens was identified by TLC. Some of the identified species are *Bactrospora metabola* (Nyl.) Egea& Torrente, *Cresponea flava* (Vain.) Egea & Torrente, *C. proximata* (Nyl.) Egea & Torrente, *Cryptothecia scripta* G. Thor, *Dictyonema irrigatum* (Berk. & M.A. Curtis) Lücking, *Dirinari aapplanata* (Fée) D.D. Awasthi, *D. confluens* (Fr.) D.D. Awasthi etc.



Chiodecton nortsticticum Jagadeesh

Parmotrema rarum Krog Swinscow

Achievements/ Outcomes in 2014-15 : The present study reports *Dictyonema irrigatum* (Berk. & M. A. Curtis) Lücking (Hygrophoraceae) as the first Basidiolichen in India. Besides, four new species: *Bactrospora littoralis* Jagadeesh, *Bactrospora medians* Jagadeesh, *Chiodecton andamanicum* Jagadeesh and *Sagenidiopsis atroalba* Jagadeesh (Roccellaceae) from the Andaman Islands, a new species from Eastern Himalaya and 4 new records for India from the Andaman Islands (*Bactrospora carolinensis* (Ellis & Everh.) R. C. Harris, *Opegrapha apomelana* A. Massal., *Opegrapha dekeselii* Ertz., *Opegrapha robusta* Vain. (Rocellaceae) were published.

3. Project : Flora of Trinket Island, Central Nicobar

Executing Scientist : Dr. M. Y. Kamble

Date of Initiation : 01 April 2014

Date to be completion : 31 March 2015

Background of the Project : Floristic studies of State Flora

Area and locality of the Allotted Project : Trinket Island, *c.* 29 sq. km. (Central Nicobar)

Summary of the work done during 2014-2015 : During this period, two field tours *w.e.f.* 05.10.2014 to 13.10.2014 and 04.12.2014 to 12.12.2014 to Trinket Island, Central Nicobar were conducted in which 210 field numbers of plant specimens along with altitude, latitude and longitude data were collected and noted down. During these tours, 1200 photographs of plants and vegetation were taken of which 830 plant specimens of 172 species under 157 genera and 74 families (Angiosperms, Gymnosperms and Pteridophytes) were properly identified based on available literature and authentic herbarium sheets in BSI. During this period, 620 herbarium specimens were incorporated in ANRC. The final Manuscript of "Flora of Trinket Island, Central Nicobar" was submitted.

Achievements/ Outcomes in 2014-15: During this period, 5 endemic taxa [*Dillenia andamanica* C. E. Parkinson (Dilleniaceae), *Glochidion calocarpum* Kurz (Euphorbiaceae), *Calamus nicobaricus* Becc., *Bentinckia nicobarica* (Kurz) Becc. (Arecaceae) and *Sphaeropteris albo-setacea* (Bedd.) Tryon (Cyatheaceae) were recorded from Andaman & Nicobar Islands. One new species (*Dimeria andamanica* Gosavi, M.Y. Kamble, Chandore and S. R. Yadav, *sp. nov.*) was described, two (02) new generic record *Nechamandra* Planch. (Hydrocharitaceae), *Aira* L. (Poaceae) and six (06) new species (*Utricularia uliginosa* Vahl (Lentibulariaceae), *Eleocharis atropurpurea* (Retz.) J. Presl. & C. Presl. (Cyperaceae), *E. ochrostachys* Steud., *E. spiralis* (Rottb.) Roem. & Schult., *Nymphaea nicrantha* Guill. & Perr. (Nymphaeaceae), *N. omarana* Hort. ex Gard. were reported. Information on some economic plants of Trinket Island were also collected.

Pinanga manii Becc.

1. Project : Ethnobotany of Dang District, Gujarat

Executing Scientist(s) : Dr. Vinod Maina
Shri Ravi Prasad

Date of initiation : 01 April 2012

Date to be completion : 31 March 2015

Background of the Project : Ethnobotanical study of Dang District, Gujarat.

Area and locality of the Allotted Project : The 'Dangs', commonly known as "Dandakaranya or Dandak Van" during the period of Ramayana, is the only district of Gujarat with dense forest cover. The district (20° 33' -21°5' N latitude and 73°27' and 73°57' E longitude) covering an area of 1764 sq. km.

Indigenous musical instrument

Summary of the work done during 2014-15 : During this year, two field tours w.e.f. 30.09.2014 to 14.10.2014 and 07.03.2015 to 21.03.2015 were conducted in more than 100 sample localities in different forest range of North and South Dang Dist. inhabited by Bhil, Konkani, Gamit, Varli and Kotwalia. During this study, a total of 377 field numbers of plant species were collected of which 240 field numbers were identified. During study and exploration tours about 230 photographs of plants, tribal people and vegetation type were taken. In addition to this, video clips of tribal activities and interviews were collected. In addition, 09 RET plants, 35 live individuals of 15 species and seeds of 22 plant species were collected for *ex-situ* conservation in Botanic Garden of AZRC. About 19 museum exhibits were collected for display.

Achievements/ Outcomes in 2014-15: Ethnobotanical information (ethno-medicinal, ethno-veterinary, fodder plants, food plants, fish poison, agricultural implements, socio-religious, magico-religious etc) of about 130 plants were collected by interaction with local people.

2. Project : Floral diversity of Shoolpaneshwer Wildlife Sanctuary, Narmada District, Gujarat (India).

Executing Scientist(s) : Dr. S.L. Meena
Dr. Harikrishna Peddi

Date of initiation : 01 April 2012

Date to be completion : 31 March 2015

Background of the Project : Floristic studies on protected areas.

Area and locality of the Allotted Project : The area of SWLS has been declared in three stages in different years. Initially, an area of 150.87 sq. km was declared as Dumkhal Sloth Bear Sanctuary in 1982. Surrounding forest areas of 297 sq. km was further added to the sanctuary in 1987. Finally an area of 159.52 sq. km was added to the sanctuary in 1989. At present the WLS comprising total area about 607 sq. km.

Summary of the work done during 2014-15 : During the period under report, two botanical exploration tours w.e.f. 19.08.2014 to 09.09.2014 (Q_3) and 16.03.2015 to 27.03.2015 (Q_4) to Shoolpaneshwer W.L.S. were conducted and collected a total of 209 field nos. of 1254 plant specimens along with GPS data and digital photographs of each plant and vegetation types. Literature related to concerned study area from Forest Department, Rajpipla (Narmada Dt.) and M.S. University, Vadodara (Gujarat) were consulted. A total 313 field nos. of plant specimens were identified and label writing completed for 313 (one-sheet each) specimens collected in previous tours.

Achievements/Outcomes in 2014 -15 : A number of new additions (genera and species) are reported from the protected area (Shoolpaneshwer WLS) and also addition to the Flora of Gujarat State. This study reports *Spigelia anthelmia* L. (Loganiaceae), a new record for Gujarat state.

Location of Shoolpaneshwer WLS and road towards sanctuary

ARUNACHAL PRADESH REGIONAL CENTRE, ITANAGAR

1. Project : Flora of Pakke Wild Life Sanctuary & Tiger Reserve, Arunachal Pradesh

Executing Scientist(s) : Dr. P. Satyanarayana
Shri B.B.T.Tham

Date of initiation : 01 April 2012

Date to be completion : 31 March 2017

Objective : To document the Floral diversity of the vascular plants of the reserve and to highlight the plant wealth of the protected area along with threats and conservation measures proposed.

Area and locality of the Allotted Project : 862 sq.km, East Kameng District., Arunachal Pradesh.

Pakke Wild Life Sanctuary and Tiger Reserve : Pakke Wild Life Sanctuary and Tiger Reserve, situated in the foothills of Eastern Himalaya, East Kameng district, Arunachal Pradesh, lies between 92°36' – 93°09' E and 26°54' – 27°16' N latitude, having an area of about 862 sq. km, with an elevation ranging from 100 m to 2000 m. The vegetation of the area is Tropical Semi-evergreen as the main component in Plains and Sub-Tropical broad-leaved forest at higher elevation between 900-1800 m. The climate is hot and highly humid at lower elevations and mildly cold in the higher elevations.

Background of the Project : The proper floristic documentation of an area is very much essential for planning proper management strategies for the plant wealth in a sustainable way. Till date the flora of the area was not completed though some superficial study was done earlier with very little floristic survey. The present assignment is an intensive 'Flora Documentation Project' to highlight the Floral Wealth of this area.

Musa kamengensis Gogoi & Hakkinen

Arisaema bannaense H.Li.

Summary of the work done: During this year, one field tour was conducted in Q3 (*w.e.f.* 21st October to 11th November 2014) and surveyed the areas of Northern Range of Pakke (Bhalukpung Ghat, Tenga RF, Khupi), of the altitude of 170 m to 1200 m. During the tour, 149 field nos. of plant specimens were collected along with 60 photographs, 09 live plants such as *Musa kamengensis, Musa cheesmanii, Musa flaviflora, Musa sikkimensis, Hedychium villosum, Hedychium spicatum, Hedychium coccineum, Costus speciosus, Papilionanthe teres* and *Pholidota imbricate* were collected for introduction in the garden. One Herbarium consultation tour to ASSAM Herbarium, Shillong was undertaken, during 14th July to 1st August 2014 and identified 185 specimens. Besides 249 species identified and documented.

Achievements/ Outcomes in 2014-15 : Published *Arisaema bannaense* H.Li., from West Kameng Dist. as new addition to Indian Flora.

2. Project : Study of *Impatiens* L. of Arunachal Pradesh

Executing Scientist : Dr. Rajib Gogoi

Date of initiation : 01 April 2013

Date to be completion : 31 March 2016

Objective : Documentation of the species diversity of the genus *Impatiens* L. in Arunachal Pradesh.

Area and locality of the Allotted Project : Entire Arunachal Pradesh.

Background of the Project : *Impatiens* L., the largest genus of Indian Flora, is one of the most complex taxon due to its polymorphic flowers. Arunachal Pradesh harbours a good numbers of *Impatiens* species. However, no taxonomic account on the genus is found for the state of Arunachal Pradesh, except some classical collection by William Griffith. So there is a need to ascertain diversity of the genus in the state.

Impatiens paramjitiana Gogoi & Borah

Rhododendron pseudomaddenii A.A.Mao & M.Bhaumik

Summary of the work done 2014-15 : During this period, two (02) field tours were undertaken of which 1st one conducted on 13.09.2014 to Poting (50 sq. km) and collected four (04) species of *Impatiens* L., 2nd one conducted *w.e.f.* 21.10.2014 to 11.11.2014 and collected eight (8) species from Western Arunachal Pradesh i.e. total of 12 species of *Impatiens* was collected along with photographs. All the specimens were processed, mounted, a total of 22 species were identified and documented. Some of which are *Impatiens tripetala* Hook. f. (No.: 21976), *Impatiens racemosa* DC. (No. 21967), *Impatiens gammiei* Hook. f. (No. 21973), *Impatiens bracteolata* Hook. f. (No.: 21966), *Impatiens marianae* Rchb. f. ex Hook.f. (No.: 39036), *Impatiens paramjitiana* Gogoi & Borah (No.: 30538), *Impatiens manipurensis* Hook. f. (No.: 21845), *Impatiens radiata* Hook. f. (No.: 30526, No.: 30538), *Impatiens walleriana* Hook. f. (No.: 21981).

Achievements/Outcomes in 2014-15 : The present study has reported 2 species (*Impatiens siangensis* Gogoi, *Impatiens paramjitiana* Gogoi & Borah) as new to science, 4 species (*Impatiens toppinii* Dunn, *Impatiens yui* S.T. Huang, *Impatiens xanthina* H. F. Comber, *Impatiens fugongensis* K.M. Liu & Y.Y. Cong) as new to India and 01 species *Impatiens porrecta* Hook. f. was rediscovered.

3. Project : Flora of East Siang District (*c.* 4005 sq.km), Arunachal Pradesh.

Executing Scientist : Dr. M. Bhaumik

Date of initiation : 01 April 2013

Date to be completion : 31 March 2017

Objective : To document the floral diversity of East Siang District of Arunachal Pradesh.

Area and locality of the Allotted Project : *c.* 4005 sq. km, East Siang District, Arunachal Pradesh, India.

Summary of the work done during 2014-15 : During the period, two field tours were undertaken of which in 1st tour surveyed about 700 sq. km and collected 238 field numbers of plant specimens, similarly in 2nd tour about 1200 sq. km surveyed and collected 236 field nos. of plant specimens. Also collected 3 live plants *viz. Phaius mishmensis* (Lindl. & Paxton) Rchb.f. (Orchidaceae); *Larsenianthus* sp., *Parakaempferia synantha* A.S.Rao & D.M.Verma for introduction purpose in garden. A total of 275 field numbers were identified, incorporated 590 herbarium sheets. Besides One Herbarium Consultation tour was also undertaken to BSI, ERC, Shillong (ASSAM), FRI, Dehradun (DD) and CNH, Howrah (CAL) w.e.f. 9.11.2014 to 18.12.14 and studied 1200 herbarium specimen and 215 field numbers were identified.

Achievements/Outcomes in 2014-15 : The present study reports two species new to science (*Adinandra kamalae* Pathak, M.K., M. Bhaumik & G. Krishna and *Rhododendron pseudomaddenii* A.A.Mao & M.Bhaumik); 11 new distributional records for India [(2 genera, 9 species) (viz., *Adonis davidii* Franchet (Ranunculaceae); *Schisandra incarnata* Stapf (Schisandraceae); *Acrotrema costatum* Jack. (Dilleniaceae); *Hypericum petiolulatum* subsp. *yunnanense* (Franch.) N. Robson (Hypericaceae); *Leptomischus primuloides* Drake (Rubiaceae); *Cotoneaster chengkangensis* T. T. Yu (Rosaceae); *Pternopetalum gracillimum* (H. Wolff) Hand.-Mazz. (Apiaceae); *Swertia handeliana* Harry Sm. (Gentianaceae); *Mazus celsioides* Hand.-Mazz. (Scrophulariaceae); *Pterygiella bartschioides* Hand.-Mazz. (Scrophulariaceae) and *Pogonia japonica* Rchb. f. (Orchidaceae)]; One new species (*Parakaempferia synantha* A. S. Rao & D. M. Verma) for state.

4. Project : Polypodiaceae of North-East India

Executing Scientist : Dr. Vineet Kumar Rawat

Date of initiation : 01 April 2012

Date to be completion : 31 March 2016

Objective : To document the Polypodiaceae diversity of North Eastern India.

Background of the Project : As far as the Pteridophytic diversity is concerned, out of 27 genera reported from India, 25 are recorded from North-East India. Among these, Polypodiaceae is a large family of tropical ferns mostly represented by the dominant distribution in the N.E. Region. The present project aims at to document the Polypodiaceae diversity of North Eastern India.

Area and locality of the Allotted Project : The Entire North East region of India with a land area of about 2,52,700 sq.km comprising the states of Arunachal Pradesh, Assam, Manipur, Meghalaya, Nagaland, Tripura and Mizoram.

Summary of the work done during 2014-15 : During this period, three field tours *w.e.f.* 19.11.2014 to 05.11.2014, 16.08.2014-07.08.2014 and 13.02.2015-25.02.2015 to Itanagar Wildlife Sanctuary, Anjaw, Lower Dibang Valley, Lohit and Manipur were conducted and collected a total of 365 field numbers of plant specimens of which 209 field numbers were identified. Besides one herbarium consultation tours *w.e.f.* 16.08.2014 to 07.09.2014 to CNH-Kolkata and BSI-Shillong (ASSAM) were undertaken and identified 87 ferns specimens. Listed 256 fern species under Polypodiaceae of

Pyrrosia Subfurfuracea (Hook.) Ching

Phymatosorus cuspidatus (D. Don.) Pic.- Serm.

NE India from CNH & ASSAM herbarium including 112 species of fern family Polypodiaceae. Photograph of more than 125 species of ferns specimens were taken.

Achievements/ Outcomes in 2014-15 : The present study has reported one new record for Aruanchal Pradesh, rediscovery of 6 species, gathered ethnobotanical information of 28 species and 15 species were brought to APRC for introduction and multiplication purpose.

5. Project : Grass flora of Arunachal Pradesh

Executing Scientist : Dr. Manish K. Kandwal

Date of initiation : 01 April 2012

Date to be completion : 31 March 2017

Objective : To document the Grass floral diversity of the Arunachal Pradesh.

Background of the Project : In spite of several floristic surveys in the past, no single account of grasses from the state were published except some sporadic reports mentioned in the district floras. Hence the state Arunachala Pradesh whole is taken for grass flora.

Area and locality of the Allotted Project : Arunachal Pradesh, located between 26.28° N and 29.30° N latitude and 91.20° E and 97.30° E longitude, covering an area of 83,743 sq.km. The area is bounded by the Himalaya in the north and by pitkoi hills on the east. The state shares 300 km of international border with Tibet, Bhutan and Burma. The altitude of the area varies from 200 m to more than 7000 m. Topographically the whole area is occupied by lofty hill ridges and valleys.

Summary of the work done during 2014-15 : Two field tours w.e.f. 18.8.2014 - 14.9. 2014 and 14.11.2014 - 28.11. 2014 were conducted to different localities of Siang district and Zero and Talley valley in Subansiri district. During the

exploration tours, a total of 307 field numbers of plant specimens were collected along with more than 120 photographs. A total of 94 field numbers were identified. Beside, one herbarium consultation tour w.e.f. 03. 3. 2015 – 27.3.2015 was conducted to DD herbarium and studied about 94 herbarium specimens.

Achievements/ Outcomes in 2014-15 : This study has described one new species (*Danthonia goriensis*); one new distributional record for India (*Calama grotis*) and one new generic record (*Trisetum spicatum*) form state.

6. Project : Flora of Lohit district and Flora of Kamlang Wildlife Sanctuary, Arunachal Pradesh

Executing Scientist : Dr. Souravjyoti Borah

Date of initiation : 01 April 2012

Date to be completion : 31 March 2017

Objective : To document the floral diversity of the vascular plants of the reserve and to highlight the plant wealth of the area along with threats and conservation measures proposed.

Background of the Project : Floristic inventory provides the basic information about plant wealth composition of an area and is prerequisite for fundamental research in an ecosystem. Floristic work at district level was carried out in many districts of Arunachal Pradesh mainly by Botanical Survey of India. Till date as district flora was not completed and also very little floristic survey was performed, it is thus imperative to have a proper documentation of current status of the plant resources of the district for proper management planning.

Area and locality of the Allotted Project : The Lohit District of Arunachal Pradesh, with geographical area of 5,212 sq. km is situated on the North Eastern part of the state. The district is bounded from the north by part of Anjaw and

Impatiens fugongensis K.M.Liu & Y. Y. Cong.

Impatiens yui S.T. Huang

lower Dibang Valley of Arunachal Pradesh, Changlang district from the south, in the east by part of Anjaw district and Burma and the western side is bounded by Assam and Dibang valley district. The district has a total forest cover of 7,611 sq. km. The climate is hot and highly humid in the lower elevations and in the Valleys and mildly cold in the higher elevations.

Summary of the work done during 2014-15 : During this period, two field tours *w.e.f.* 08-06-2014 to 26-06-2014 and 21-10-2014 to 11-11-2014 to different localities of Lohit district were undertaken. A total of 488 field numbers were collected along with more than 350 photographs. Two (02) live germplasm of *Steudnera colocasioides* and *Colocasia boyceana* were collected for *ex-situ* conservation purpose. A total of 268 field numbers of plant specimens were identified. In addition, one herbarium consultation tour *w.e.f.* 01-03-2015 to 22-03-2015 was conducted to ASSAM herbarium and identified 163 field numbers of plant specimens.

Achievements/Outcomes in 2014-15 : This study reports one (01) new species to India (*Impatiens toppinii* Dunn); eight (08) new to science (*Impatiens lohitensis* Gogoi & Borah; *Musa markkui Gogoi & Borah; Colocasia boyceana* Gogoi & Borah; *Musa argentii* Gogoi & Borah, *Impatiens paranjitiana* Gogoi & Borah; *Impatiens siangensis* Gogoi; *Musa mannii* var. *namdangensis* Gogoi & Borah; *Colocasia dibangensis* Gogoi & Borah) and seven (07) new records for India (*Impatiens siculifer* Hook.f.; *Tricarpelema chinensis* Hong; *Impatiens toppinii* Dunn; *Colocasia lihengiae* C.L.Long & K.M.Liu, *Impatiens fugongensis* K.M.Liu & Y.Y. Cong; *Impatiens yui* S.T. Huang; *Impatiens xanthina* H. F. Comber) and rediscovery of four (04) species (*Impatiens laevigata* var. *grandifolia* Hook.f., *Musa cheesmanii* N.W. Simmonds; *Musa flaviflora* N. W. Simmonds, *Impatiens toppinii* Dunn).

1. Project : Pharmacognostic studies on Medicinal Aconites of India

Executing Scientist : Dr. A.B.D. Selvam

Date of initiation : 01 August 2010

Date to be completion : 31st March 2015

Background of the Project : Study of the genus *Aconitum* in India (mainly medicinal Aconites) pharmacognostically.

Area and locality of the Allotted Project : Alpine and sub-alpine regions of Himalayas (Eastern Himalayas, Western Himalayas & Sikkim Himalayas).

Summary of the work done during 2014-15 : Two field tours had been undertaken. One to different parts of Jammu & Kashmir and Himachal Pradesh w.e.f. 13.08.14 - 27.09.14 and collected 3 Aconites. The other tour to different parts of Tawang district of Arunachal Pradesh w.e.f. 03.10.14 - 14.10.14 and collected 3 Aconites.

Completed pharmacognostic studies on four Medicinal Aconites, viz., *Aconitum deinorrhizum* Stapf, *A. assamicum* Stapf, *A. hookeri* Stapf and *Aconitum* spp. on four pharmacognostic parameters such as Organoleptic, Anatomical, Powder Microscopic and SEM studies.

Pharmacognostically studied and authenticated 55 crude drug samples, of which 51 samples are CITES and Negative Listed Plants, which were received from Government departments, research institutions and individuals and generated revenue of Rs. 20,500/- for the Department.

Achievements/ Outcomes in 2014-15 : Two field tours covered an area about 325 sq. km and collected 4 different species of *Aconitum*. Pharmacognostical study revealed 55 crude drug samples, of which 51 samples are CITES and Negative Listed Plants.

2. Project : Ethnobotanical study of Odisha, (Phase-II), Ganjam District

Executing Scientist(s) : Sri A.C. Halder
Sri Nagaraju Siddabatula
Sri Amit Diwakar Pandey

Date of initiation : 01 April 2013

Date to be completion : 31 March 2015
(Manuscript submitted)

Background of the Project : There has been less known ethno botanical work in the Ganjam district.

Tribe : Kondh, Sabar, Soura, Munda and Bhuiya.

Area and locality of the Allotted Project : The study covers entire Ganjam district of Odisha. The district is bounded in its three sides by Khurda, Phulbani and Gajapati. The Bay of Bengal in the Southeast covers approximately 60 kms of coastal length. The Geographical area of Ganjam District is about 8070 sq. km. Out of these 3149.90 sq. km are forested area. Total area surveyed approximate 4000 sq. km.

Making of serving cups from *Sal* leaves.

Summary of the work done during 2014-15: One Field Tour w.e.f. 25.11.2014 to 10.12.2014 (15 days) undertaken to the area. Total area surveyed approximate 4000 sq. km, 181 nos. of ethnobotanically interested species had been collected with the help of medicine man (Baidya or elder village people) from different tribal populated village areas and 223 ethnobotanical uses were recorded. Out of 223 uses, medicinal 151, veterinary medicine 2, food 38, tooth brush 7, Insect repellent 4, dye making 2, rope making 5, country liquor 1, plate making 1 and other purposes 12.

Achievements/Outcomes in 2014-15 : Two ethnobotanical field tours were undertaken a) Ganjam district b) Jajpur district of Odisha. From Ganjam district 181 field Nos. had been collected. 176 plant specimens were identified and all

Collecting ethnobotnical informations from local inhabitants

the specimens were incorporated. Number of Photographs taken during the tour and photographs identified 190. Paper on ethnobotanical plants of Jajpur district, Orissa communicated for publication.

3. Project : Ethnobotany of Koraput District, Odisha

Executing Scientist(s) : Dr. (Mrs.) Sujana K.A.
Mrs. Monika Mishra
Dr. Dhole Pankaj Arvind &
Sri Amit Diwakar Pandey

Date of initiation : 01 April 2013

Date to be completion : 31 March 2015

Data collection from tribal hamlets

Background of the Project : To record the ethnobotanical uses from Koraput District, Odisha.

Area and locality of the Allotted Project : Koraput district, Odisha

Summary of the work done during 2014-15 : Different tribal populated areas and 20 villages in different forest ranges of Koraput district were visited during this tour and interacted with 5 types of tribe. A total of 243 plants collected with 266 ethno botanical information during the field survey had been gathered. More than 500 photographs of tribal habitat, useful plants and study area were documented. 243 plant species identified and documented.

Achievements / Outcomes in 2014-15 : A total of 12 materials for museum also collected.

4. Project : Ethnobotanical Study of Deogarh District, Odisha-Phase II

Executing Scientist(s) : Dr. Harish Singh
Sri P. K. Baske
Sri R. Saravanan &
Dr. P. A. Dhole

Date of initiation : 01 April 2013

Date to be completion : 31 March 2015

Background of the Project : The district is considered ideal from ethnobotanical study point of view, as rich in floristic as well as in ethnic diversity. Some tribal folks inhabits in

Collection of firewood : A menace to local forest

Edible bracts of *Flemingia bracteata* (Roxb.) Wight :

and around the forest areas and used many locally available plant species in their daily life for various purposes Altogether, 92,103 tribal population of 32 tribal groups are there.

Area and locality of the Allotted Project : The district covers a geographical area of 2,782 sq. km with 1, 29,335 hactare forest areas. It is surrounded by Sundargarh district on the North, Angul District on the East and South and Sambalpur District on the West.

Summary of the work done during 2014-15 : One field tour w.e.f. 11-08-14 to 24-08-14 (approx. area 1250 sq. km) was undertaken. Surveyed About 47 tribal villages of Balam, Deogarh, Barkote, Pallahara and Reamal Forest ranges of Deogarh forest Division and interacted with several tribal groups namely Oraon, Munda, Kisan, Gond, Bhuinya, Paudia Bhuinya, Kolho, Khadia, Shabar, Binjhal, etc.

Achievements : 343 ethnobotanical information recorded of which 290 for medicine, 27 for edible, 10 magico-religions, 5 religions, 2 fish poison and dye – 1. Also recorded 12 less known medicinal uses.

5. Project : Ethnobotanical study of Jajpur District, Odisha

Executing Scientist(s) : Sri Probal Kumar Baske
Sri A.C. Halder
Dr. P.A. Dhole
Date of initiation : 01 April 2013
Date to be completion : 31 March 2015

Background of the Project : This is the first time Ethnobotanical field study in Jajpur Districit, Odisha. Previously only fragmentary work had been done.

Area and locality of the Allotted Project : Different tribal populated areas and villages of four different forest Ranges of Cuttack Forest Division of Jajpur district were visited.

Abrus precatorius L.

Summary of the work done during 2014-2015 : One ethnobotanical field tour was undertaken in 2014 covering several tribal populated areas and villages and 166 species (in duplicate voucher specimens) were collected with the help of medicine man (Baidya or elder village people. About 190 ethnobotanical uses had been recorded. Out of which medicinal (120), food (37), tooth brush (5), hair oil (1), insect repellent(6), basket making (2), dye making (3), rope making (1), and 15 for other purposes. GPS was used and recorded data of location of different places.

Achievements / Outcomes in 2014-2015 : Only one field tour was undertaken. 166 specimens had been collected of which 156 ethnobotanical important plant specimens identified and incorporated in the Herbarium. About 200 photographs of different plant specimens and tribal habitation had taken by Digital camera. During this period, collected 286 field numbers (in duplicate) comprising 343 ethnobotanical information, which are used by the tribes and other rural people for different purposes e.g. medicine (290), edible (27), magico-religious beliefs (10), religious (5), Fish poison (2), dye (1), miscellaneous (7) etc. Particularly in case of medicinal plants, the information were on rheumatic pains, gout (*Vata*), fever, stomachache, diarrhea, dysentery, spermatorrhoea etc.given emphasis. Bulk collection of one plant parts of edible (leaves of *Sauropus androgynus*) also collected and supplied to Chemistry section for their nutraceutical analysis.

Ethnobotanical information e.g. medicine (290), edible (27), magico-religious beliefs (10), religious (5), Fish poison (2), dye (1), miscellaneous (7) etc. Particularly in case of medicinal plants, the information on rheumatic pains, gout (*Vata*), fever, stomachache, diarrhea, dysentery, spermatorrhoea etc. Also collected 430 digital photographs of tribal, medicine men, their villages, forests, plants, plant products etc. and recorded interview of the tribal medicine man (*Kaviraj*).

CENTRAL NATIONAL HERBARIUM, HOWRAH

1. Project : Flora of Gautam Buddha Wildlife Sanctuary, Bihar & Jharkhand

Executing Scientist(s) : Drs. P. Venu & Anand Kumar

Date of initiation : 01 April 2012

Date to be completion : 31 March 2016

Objectives : Survey, collection and documentation of plant resources from Gautam Buddha Wildlife Sanctuary, Bihar & Jharkhand.

Background of the Project : Gautam Buddha Wildlife Sanctuary (GBWLS) was notified in 1976 (*vide* Gazette notification no. 1485 dated 14.09.1976). It is situated in Gaya district of Bihar and Hazaribag & Chatra districts of Jharkhand and lies between 24°19'-24°31'N latitudes and 84°59' E - 85°17' E longitudes and covering protected forest areas of three forest divisions *viz.* Gaya, Koderma and Chatra. It covers an area of 259.5 sq.km of which 138.33 sq. km in Bihar and 121.14 sq. km in Jharkhand. The forests of the Sanctuary fall under Northern tropical dry deciduous forest. A perusal of literature reveals that no comprehensive floristic study was done in GBWLS, therefore,survey, collection and documentation of plant resources of Gautam Buddha Wildlife Sanctuary, Bihar & Jharkhand was taken up.

Typhonium inopinatum Prain

Area and locality of the allotted project : 259.5 sq.km; Gaya District of Bihar and Hazaribag & Chatra Districts of Jharkhand.

Summary of the work done during 2014-15 : Two field tours were undertaken during 21.05.2014 to 06.06.2014 and 5th to 21th November, 2014 and collected a total of 404 field numbers of plant specimens of which 148 species were identified. Besides, more than 1000 high resolution photographs were also taken.

Achievements/ Outcomes in 2014-15: During this study, *Typhonium inopinatum* Prain (Araceae) was collected after a lapse of 115 years.

2. Project : Flora of Buxa Wildlife Sanctuary, Jalpaiguri. West Bengal.

Executing Scientist(s) : Dr. P. Venu & Anant Kumar

Date of initiation : 01 April 2011

Date to be completion : 31 May 2015

Area and locality of the Allotted Project : *c.* 251.86 sq. km, Jalpaiguri District, West Bengal.

Summary of the work done during 2014-15 : One field tour w.e.f. 17.05.14 to 24.05.14 was conducted to Chunabhati, Buxaduar, Santalabari, Lepchakha, Achalung and Tashigaon. A total of 118 field numbers were collected and 430 photographs were taken. In all, 210 field numbers were identified including collection from previous tours. Taxonomic descriptions along with dissection of 233 species were also prepared.

3. Project : Revision of the genus *Fimbristylis*, family Cyperacea (*c.* 120 sp. and 12 infraspecific taxa)

Executing Scientist : Dr. V.P. Prasad

Date of initiation : 01 April 2013

Date to be completion : 31 March 2016

Objectives : The primary objective is to gather all the available information on the genus in India from literature and by studying the specimens of all the species in different herbaria and to bring out an up-to-date taxonomic account of the genus.

Background of the Project : The genus *Fimbristylis* (Cyperaceae) with *c.* 120 species in India, found mostly in the peninsular region. Around 47 new taxa of this genus have been described by different workers in the last three decades and the types of all these names have to be studied thoroughly, besides all other species. Hence, revising this genus is challenging and a long process.

Area and locality of the Allotted Project : Entire India.

Summary of the work done during 2014-15 : One collection tour w.e.f. 25-08-2014 to 08-09-14 to Silent Valley National Park, Villengiri hills, Palani hills, Nilgiris, Waynaad forests and Athirapally water fall areas was undertaken and collected about 460 plant specimens of Cyperaceae under 151 field numbers. One herbarium consultation tour *w.e.f.* 17.11.2014-23.11.2014 was conducted to BLAT, Mumbai, AHMA and BSI, Pune and consulted 80 plant specimens of 18 species of *Fimbristylis* in BLAT, 60 specimens of 17 species and 130 specimens of 21 species in AHMA and BSI respectively. Besides this, about 100 photographs were also taken.

4. Project : Flora of Jaldapara National Park, West Bengal, India

Executing Scientist : Dr. K. Karthigeyan

Date of initiation : 01 April 2012

Date to be completion : 31 March 2015

Objectives : To survey and document the floristic diversity of Jaldapara National Park.

Background of the Project : The Jaldapara National Park (JNP), situated in the district of Jalpaiguri, West Bengal, lies between 25° 58′ to 27° 45′ N latitudes and 89° 08′ to 89° 55′ E longitudes. The sanctuary is floristically rich with a number of endemic and threatened species and plants of economic value.

View of river Torsa in Jaldapara National Park

Hibiscus fragrans Roxb.

Summary of the work done during 2014-15 : Two field tours were conducted covering all the areas of national park. A total of 257 field numbers of plant specimens were collected and around 250 photographs were taken to document the plant diversity and the vegetation of the area. GPS location details were recorded for all the plants collected. In all, 160 species were identified and taxonomic descriptions prepared for 50 species.

Achievements / Outcomes in 2014-15 : During this study, five new records to the state flora of West Bengal were recorded viz., *Clerodendrum hastatum* (Roxb.) Lindl. (Verbenaceae), *Cissus elongata* Roxb. (Vitaceae) and *Trachelospermum assamense* Woodson (Apocynaceae), *Ficus concinna* (Miq.) Miq. and *Murdannia hookerii* G. Bruckn. A rare species *Ixora longibracteata* Bremek. (Rubiaceae) was collected after its type collection which also forms a new report to the flora of India. An endemic and poorly known species, *Premna jalpaiguriana* T.K. Paul (Verbenaceae) was recollected over three decades after its type collection and photographed for the first time. Besides this, one new species *Habenaria osmastonii* Karthig.*& al.* described, three new record to India *Ampelocissus hoabinhensis* C.L.Li (Vitaceae), *Phyllanthus gracilipes* (Miq.) Mull. Arg. (Euphorbiaceae) & *Ixora longibracteata* Bremek.(Rubiaceae) also published during the year. Besides introduced a rare and endangered climbing shrub, *Hibiscus fragrans* Roxb.in the RET section of Indian Botanic Garden. The species is so far known to occur in north east India and Bangladesh and it is rediscovered in West Bengal from Jaldapara National Park.

5. Project : Flora of Vikramshila Gangetic Dolphin Wildlife Sanctuary, Bhagalpur, Bihar

Executing Scientist : Dr. Onkar Nath Maurya

Date of initiation : 01 April 2012

Date to be completion : 31 March 2016

Bromelia pinguin L.

Area and locality of the Allotted Project : Bhagalpur, Bihar. Total area- 60 sq. km.

Summary of the work done during 2014-15 : Two field tours were undertaken from 18.06.14 to 25.06.14 and 24.12.2014 to 31.12.2014. 126 field numbers were collected with GPS coordination. Out of them 55 specimens were identified. Besides, 310 photographs were also taken.

Achievements / Outcomes in 2014-15 : This study reports *Bromelia pinguin* L. (Bromeliaceae) as new generic report for India.

6. Project : Flora of Bihar Vol.-I (Ranunculaceae-Mimosaceae)

Executing Scientist(s) : Dr. Vinay Ranjan
Dr. K. Karthigeyan
Dr. W. Arisdasan &
Dr. Onkar Nath Maurya

Area and locality of the allotted Project : Entire Bihar.

Summary of the work done : Dr. Vinay Ranjan listed out the species of Fabaceae (tribes-*Trifolieae, Aeschynomenae* & *Crotalarieae*) and completed taxonomic descriptions of 65 sp. with distribution and some photographs. Dr. K. Karthigeyan:worked out 12 sp. of Fabaceae (tribes-*Psoraleae, Galegeae, Cicereae* & *Vicieae*). Dr. W. Arisdasan: completed the taxonomic descriptions of 39 sp. of Mimosaceae. Dr. O.N. Maurya: completed the taxonomic descriptions of 13 sp. of Elaeocarpaceae, Linaceae, Erythroxylaceae & Malphighiaceae.

7. Project : Flora of Jharkhand Vol.-I (Ranunculaceae-Mimosaceae)

Executing Scientist(s) : Dr. Vinay Ranjan
Dr. K. Karthigeyan
Dr. W. Arisdasan &
Dr. Onkar Nath Maurya

Area and locality of the allotted Project: Entire Jharkhand state.

Summary of work done : Dr. Vinay Ranjan listed out the species of Fabaceae (tribes-*Trifolieae, Aeschynomenae, Crotalarieae*) and completed taxonomic descriptions of 65 sp. with distribution and some photographs. Dr. K. Karthigeyan: worked out 12 sp. of Fabaceae (tribes-*Psoraleae, Galegeae, Cicereae* & *Vicieae*) Dr. W. Arisdasan: completed the taxonomic descriptions of 39 spp. Dr. O.N. Maurya: completed the taxonomic descriptions of 13 spp. of Elaeocarpaceae, Linaceae, Erythroxylaceae & Malphighiaceae.

8. Project : Flora of West Bengal, Vol. V (Hydrocharitaceae-Poaceae)

Executing Scientist(s) : Dr. V. P. Prasad
Dr. V. Sampath Kumar
Dr. P. Lakshminarasimhan

Summary of work done : Dr. V.P. Prasad : taxonomic descriptions completed for *Dioscoreaceae* (20 spp.), *Smilacaceae* (5 spp.), *Cyperus* (45 spp.) and *Fimbristylis* (30 spp.) Dr. V. Sampath Kumar: listed out the species of the families Alismataceae, Aponogetonaceae, Butomaceae, Hydrocharitaceae, Najadaceae, Potamogetonaceae, Ruppiaceae and Zannichellaceae by referring various literature and completed taxonomic descriptions of 15 sp. of families Alismataceae, Aponogetonaceae, Hydrocharitaceae and Zannichellaceae. Dr P. Lakshminarasimhan: checked the proof of hand written manuscript of Poaceae (*c.* 400 spp.) submitted by Dr. P.R. Sur.

1. Project : Lichens of Rajasthan and Kutch, Gujarat

Executing Scientist(s) : Dr. G. P. Sinha & Sh. R. Kar

Date of initiation : 01 April 2012

Date to be completion : 31 March 2017

Background of the Project: Survey, Collection, Identification and Inventorisation of the lichens of arid areas of Rajasthan and adjoining Kutch area of Gujarat.

Area and locality of the Allotted Project :

Map of Rajasthan with collection localities

Map of Gujarat showing red marked surveyed area

Summary of the work done: Undertaken a field tour to various localities of Bhuj, Jamnagar and Dwarka districts of Gujarat *w.e.f.* 25. 11. 2014 to 12. 12. 2014. Collected 128 Field numbers of lichens from *c.* 200 sq. km surveyed area. Identified 53 specimens collected from study area into 30 species.

Achievements / Outcomes in 2014-15 : Three new records for India viz. *Malmidia psychotroides* Kalb, Rivas Plata & Lumbsch, *Staurothele rugulosa*(A. Massal.)Arnold and *Willeya diffractella* (Nyl.) Müll. Arg. and 15 New Records for the Lichen Flora of Rajasthan viz. *Aspicilia caesiocinerea* (Nyl.ex Malbr.) Arnold, *Aspicilia cinerea* (L.) Korb, *Buellia nilgiriensis* S. R. Singh & D.D. Awasthi, *Buellia quartziana* S. R. Singh & D.D. Awasthi, *Buellia stellulata* (Taylor) Mudd, *Buellia subglaziouana* S. R. Singh

Dirina indica Upreti & Nayaka

& D.D. Awasthi, *Caloplaca poliotera* A. Massal., *Collema crispum* (Huds.) Wigg., *Collema polycarpon* Hoffm., *Cratiria obscurior* (Stirt.) Marbach & Kalb, *Dimelaena oriena* (Ach.) Norm., *Endocarpon nanum* A. Singh & Upreti, *Heterodermia pseudospeciosa* (Kurok.) W.Culb., *Hyperphyscia adglutinata* (Flörke) Mayerh. & Poelt, *Hyperphyscia isidiata* Moberg were found.

2. Project : Flora of The Upper Ganga Ramsar Site, Uttar Pradesh

Executing Scientist(s) : Dr. Arti Garg
Dr. Bhavana Joshi

Date of initiation : 01 April 2012

Date to be completion : 31 March 2016

Area and locality of the Allotted Project : (26,590 hactares) The Upper Ganga Ramsar Site constitutes the wetlands dispersed in 167 km peripheral region of the holy river Ganga from Brij Ghat in districts Ghaziabad to Narora in District Badayun. This river stretch of 85 Km flows through four districts Ghaziabad, Moradabad, Bulandshahr and Badayun.

Nelumbo nucifera Gaertn.

Sacred grove forest in upper Ganga Ramsar site

A view of Chandra Prabha WLS, Chandauli, Uttar Pradesh

The ramsar site lies between 28°10'26"N to 28°47'18"N latitude and 77°07'04"E to 78°25'57"E longitudes spreading in an area of 26,590 hactare. This was declared as Ramsar site owing to its compliance of criteria 2 and 5 of the Ramsar Convention under which it supports threatened ecological communities such as the endangered river dolphins (*Platanista gangetica* subsp. *gangetica*), crocodiles, endangered turtles and more than 100 species of birds. Due to the profound religious beliefs of people residing along the banks of Ganges, the region is also endowed with pristine floristic constituents conserved within sacred groves, the Mandu and the Siddhwari Sacred groves.

Summary of work done during 2014-2015: During this period 178 specimens collected during previous years tours were identified. Nomenclatural citation, species description, uses and ecological notes were completed for 65 species along with field photographs.

3. Project : Flora of Chandra Prabha Wild Life Sanctuary, Chandauli District, Uttar Pradesh

Executing Scientist(s) : Dr. A.N. Shukla
Dr. Nitisha Srivastava

Date of initiation : 01 June 2015

Date to be completion : 31 March 2017

Background of the Project : Floristic studies on protected areas.

Area and locality of the Allotted Project: [78 sq. km] Chandra Prabha Wildlife Sanctuary situated in Chandauli district, in the south eastern division of Uttar Pradesh. The Sanctuary is spread between the area, Chakia and Naugarh, having rich vegetation over an area of 78 square kilometres. The area lies between the latitude 24°52′0′′N to 25°3′55′′ and longitude 83°03′24′′E to 83 °22′55′′. The Sanctuary was recognized in 1957 and it is the first declared Wildlife sanctuary of Uttar Pradesh. It was famous for the Asiatic Lion during 1957 to 1970. The place has also been gifted with attractive natural sceneries, picnic spots, intense forest, river and beautiful waterfalls. Two waterfalls namely Rajdari and Devdari are famous for the picnic spot.

Summary of the work done during 2014-15 : During this period, one field tour has been conducted to Chandra Prabha Wildlife Sanctuary w.e.f. 18.08.15 to 25.08.15, area covered 23 sq km. Total 185 field numbers of plant specimens have been collected. Nearly 300 photographs of the habit of plant, flowers and landscape vegetation have been exposed.

Achievements/Outcomes in 2014-15 : Ethno-botanical information of *Abutilon indicum, Acacia catechu, Adhatoda zeylanica, Aegle marmelos, Ailanthus excelsa, Andrographis paniculata, Asparagus racemosus, Azadirachta indica, Barleria prionitis, Butea monosperma, Calotropis gigantea, Cassia alata, Cassia fistula, Cassia occidentalis, Cassia tora, Curculigo orchioides, Cynodon dactylon, Cyperus rotundus, Desmodium gangeticum, Eclipta prostrata, Ficus racemosa, Gymnema sylvestre, Hemidesmus indicus, Physalis minima, Pongamia pinnata, Sida acuta, Sida cordifolia, Sida rhombifolia, Solanum nigrum, Tamarindus indica, Terminalia arjuna* and *Terminalia bellirica* were gathered. A total 50 species were identified and 20 species have been described along with updated nomenclature and ecological notes. Total 32 medicinal plants have been collected from the Wildlife Sanctuary.

4. Project : Flora of Chhattisgarh

Executing Scientist(s) : Dr. A.N. Shukla
Dr. A.P. Tiwari

Date of initiation : 01 April 2012

Date to be completion : 31 March 2017

Background of the Project : Floristic studies of the state.

Area and locality of the allotted project : Chhattisgarh state is covering an area of 1,46,361 sq km, is endowed with a very rich and diverse flora. The state lies between 17Ú46' - 24Ú5' N latitude and 80Ú15' - 84Ú20' E longitude.

Summary of the work done during 2014-15 : One herbarium consultation tour undertaken w.e.f. 29.3.2015 to 10.4.2015. Studied of herbarium specimens at Central National Herbarium, Howarh (CAL) for Flora of Chhattisgarh and total 290 field numbers examined under 22 families (Polygonaceae-Poaceae). Total 200 species were identified, 150 species described.

Achievements/Outcomes in 2014-15 : This study reported Fifteen angiospermic taxa as a new record for the state *viz.,Acmella uliginosa* (Swartz) Cassini, *Axonopus compressus* (Swartz) P. Beauvois. *Crotalaria pallida* Aiton, *Desmodium neomexicanum* A. Gray, *Hibiscus beddomei* Rakshit & Kundu, *Laggera crispata* (Vahl) Hepper & Wood, *Nervilia prainiana* (King & Pantl.) Seidenf., *Richardia scabra* L., *Remusatia vivipara* (Roxb.) Schott, *Sauromatum pedatum* (Willd.)Schott, *Solanum viarum* Dunal, *Soliva anthemifolia* (A. Juss.) R. Br. , *Spilanthes radicans* Jacq., *Stylosanthes fruticosa* (Retz.)Alston, *Tiliacora acuminata* (Lam.) Hook.f. & Thomson. 37 ethnomedicinal plants have been documented by the tribals of Jashpur district, Chhattisgarh.

Bacopa monnieri (L.) Wettst.

Sterculia villosa Roxb. ex Sm.

5. Project : Ex-situ conservation of RET and Economic Plant species in the experimental garden of CRC.

Executing Scientist : Dr. A.N. Shukla

Date of initiation : 01 April 2014

Date to be completion : 31 March 2015

About the Garden : The associated Botanic Garden, covering an area of ca 2 hectares, is situated in the same compound of main office building of Botanical Survey of India, Central Regional Centre. It has about 610 species of trees, shrubs, climbers and aquatic plants representing medicinal and otherwise economically important ornamental, rare and threatened elements of the region. The garden is divided into many distinct sections viz., Plant Introduction, Rosary, Gymnosperms, Medicinal Plants, Green House and Arboretum. In addition to these, a large population of *Rauvolfia serpentina*, a rare plant included under CITES (Appendix II) is also cultivated and multiplied regularly. In addition to these, many plants of economic importance are also growing in the associated botanic garden.

Summary of the work done during 2014-2015 : Recorded phenological data of 42, 54, 32, 25, 35, 45 plant species respectively for the year of 2014-15 growing in the garden. Maintenance of garden continued. 6 saplings of *Barringtonia acutangula* (L.) Gaertn has been introduced.

Achievements/Outcomes in 2014-15 : 4 threatened species were introduced in the garden. Recorded phenological data of plant species growing in the garden.

Rauvolfia serpentina (L.) Benth. ex Kurz.

6. Project : Floristic diversity of Parvati- Aranga Wild Life Sanctuary and adjoining Tikri forest area, Gonda, Uttar Pradesh.

Executing Scientist : Shri Vineet Kumar Singh

Date of initiation : 01 April 2014

Date to be completion : 31 March 2017

Background of the Project : Floristic studies on the protected areas.

Area and locality of the allotted Project : Total area- Approx. 80 sq. km. and Location- between 27°10' to 27° 24'N latitude and 82° 15' to 82° 20'E longitude in Gonda district of Uttar Pradesh.

Summary of the work done during 2014-15 : During April 2014- March 2015 two field tours were undertaken to the assigned area; one in the month of Aug 2014 and second in the month of March 2015 for survey and collection of the plant specimens. A total of 278 field numbers were collected including some rare and economically important plant species viz., *Gloriosa superba*, *Smilax zeylanica*, *Helminthostachys zeylanica*, *Barringtonia acutangula* etc. A total of 101 plant species were identified with different field numbers. Listing of the invasive alien species and identification of remaining field number are under progress. A total of Approx. 300 live photographs were taken.

Achievements / Outcomes in 2014-15 : A total of 101 plant species were identified with different field numbers. Listing of the invasive alien species and identification of remaining field number are under progress Collections of some rare and important plants species viz. *Gloriosa superba*, *Smilax zeylanica*, *Helminthostachys zeylanica* and wild germplasm

Gloriosa superba L.

of national flower *Nelumbo nucifera* along with sighting of some rare and nearly threatened birds like Grey headed fish eagle, Green bee eater etc. near the sanctuary. Ethnobotanical data of some highly medicinal plant species such as *Clerodendrum indicum*, *Boerhavia diffusa*, *Helminthostachys zeylanica* were also recorded. Some rare and economically important plant species *viz. Gloriosa superba*, *Smilax zeylanica*, *Helminthostachys zeylanica*, *Barringtonia acutangula* were collected and 6 saplings of *Barringtonia acutangula* has been introduced in the regional centre botanic garden. A note on status and conservation of *Gloriosa superba* has been published in *Envis*.

A landscape view of Parvati-Aranga WLS, Gonda UP

CRYPTOGAMIC UNIT, KOLKATA

1. Project : Algal Flora of Jharkhand

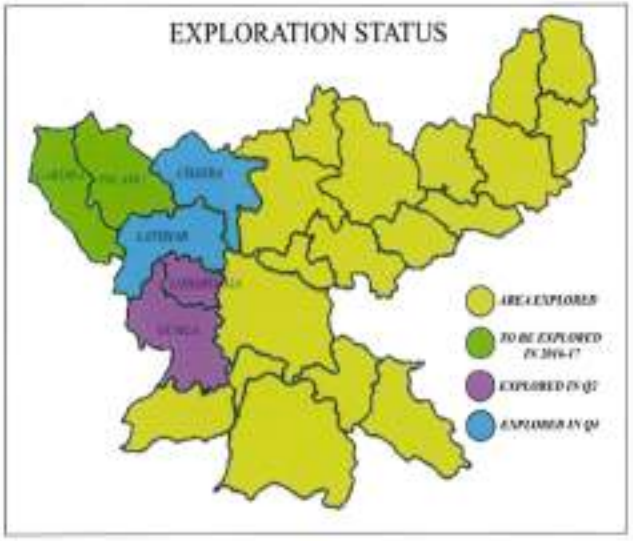
Executing Scientist : Dr. R.K. Gupta

Date of initiation : 01 April 2012

Date to be completion : 31 March 2017

Objective : To document the "Algal Flora of Jharkhand" and to highlight the algal wealth of the area. The algal flora will be useful to the policy makers to formulate effective conservation management.

Background of the Project : Algae are highly diverse group of plants with enormous economic implications not only as primary producers and pollution indicators but also as a source of several natural products, bio fertilizers and chemicals.



The state consists of one National park and ten Sanctuaries. The total forest area of the state is 23,605.47 sq. km. At present there are 24 districts in the state.

Algal flora of the state has been explored by Srivastava (1981 – 1986), Gupta and Srivastava (1994 – 1995), Arundhati and Kar Gupta (2009) and Mehta and Sahoo (2010) covered mainly the district of Ranchi, Hazaribagh and Jamshedpur but a detailed systematic account of the algal flora of the state is still lacking. The major rivers are Koel, Damodar, Brahmani, Kharkai and Swarnrekha. There are large number of aquatic habitats viz. ponds, lakes, ditches, pools, swarms, puddles, brooks, rivers and forest area which provides congenial environment for algal growth.

Area and locality of the Allotted Project : All 24 districts of Jharkhand taken into account to write the Algal flora of Jharkhand.

Habitat of *Euglena sanguinea* Ehrenberg

Summary of the work done during 2014-15 : Conducted 3 field tours to Sahibgang, Giridih, Koderma, Saraikela Khersawan, East Singhbhum, Hazaribagh and Khunti district of Jharkhand and collected 300 algal samples from the various habitat along with GPS data and taxonomically described 175 species of algae mainly belong to the members of Euglenophyceae, Cyanophyceae, Chlorophyceae and Bacillariophyceae and incorporated with proper label. About 370 microphotographs taken under Nikon microscope and CX41 Olympus microscope. About 235 microphotographs taken under SEM particularly of diatoms. During the period algae from SitaKund hotspring of Hazaribagh district of Jharkhand were also collected and studied. Collected petrified fossil from Geoheritage site of Mandro block of Rajmahal hill of Sahibgang district of Jharkhand. Algal samples collected from lotic, lentic,terrestrial, planktonic and subaerial conditions.

Achievements / Outcomes in 2014-15 : The present study described one species New to Science (*Johannesbaptistia desikacharyi*) from Jamtara district of Jharkhand

2. Project : Studies on wild mushrooms of East and South Sikkim (except Agaricaceae, Hygrophoraceae, Boletaceae, Suillaceae and Cantharellaceae)

Executing Scientist : Dr. Kanad Das
Date of initiation : 01 September 2014
Date to be completion : 31 March 2019

Background of the Project : Diverse undescribed mushroomoid mycobiota of West and North district of Sikkim have been witnessed by Botanical Survey of India and are thoroughly being documented subsequently. Therefore, in continuation of the present ongoing mission to uncover the enormous diversity of wild mushrooms (one of the most important components of ecosystem functions) of entire Sikkim State, emphasis should be given to other two districts: East and South.

Keeping in view the availability of myriad ectomycorrhizal hosts with different climatic variations (in east and south districts) with unexplored or poorly explored forested areas of 5 protected areas of these two districts, the present project has been proposed to undertake thorough macrofungal survey, collection, macro- and micromorphological characterization, identification and systematic documentation of the wild mushroomoid mycobiota which undoubtedly is the need of the hour to monitor and conserve the entire biological flora of the State Sikkim. Only five families are excluded from this project as they have already been assigned.

Russula thindii K. Das & S. L. Mill.

Area and locality of the Allotted Project : 1714 sq. Km.; East and South districts of the State of Sikkim being located in Eastern Himalaya.

Alpine forest of East Sikkim

Summary of the work done during 2014-15 : One combined macrofungal exploration tour to different parts of Subtropical to Subalpine areas of North and East Districts of Sikkim from 18.07.2014 to 10.08.2014 especially, in Churten, Phadamchen and surrounding areas, Memeinchu and surrounding areas, Kyangnosla alpine sanctuary were undertaken. In total 37 samples (field nos.) belonging to 35 species were collected. Macromorphological characterization (in the field) followed by micromorphological characterization (in the laboratory) of different groups of wild mushrooms belonging to Ascomycota and Basidiomata in connection with the allotted AAP project were executed. In total 9 field nos. belonging to 9 species were identified. Description, photographic and drawing illustrations of specimens belonging to Russulaceae, Marasmiaceae, Cortinariaceae etc. were made. Undertaken SEM-study of 4 basidiospores of wild mushrooms collected from East district of Sikkim. Besides 117 species were documented, 110 photographs wer taken. During the period, information on 4 different edible species were also collected.

Achievements/Outcomes in 2014-15 : The present work has gathered ethnobotanical Information for 4 different edible species *viz. Russula thindii* K. Das & S. L. Mill., *Pseudohydnum gelatinosum* Scop. P. Karst., and two *Russula* species.

3. Project : Studies on wild mushrooms of North Sikkim

Executing Scientist : Dr. Kanad Das
Date of initiation : 01 September 2011
Date to be completion : 31 August 2014

Background of the Project : Continuous human exploitation of nature has dramatically perturbed biodiversity patterns on earth and has lead to catastrophic extinctions of species, many of which remained undescribed. Our attempts to understand, conserve and restore biodiversity, however, are hampered due to our limited ecological and taxonomic knowledge of extant global biota. Fungi represent one of the largest groups of living organisms on the planet. Acting as symbionts, saprophytes or parasites, they play a prominent role in ecosystem functioning, and thus for the survival of many other species. Yet, fungi remain one of the least well-studied groups of organisms, and efforts to document their diversity, in order to conserve it, need to be prioritized. Although Sikkim belongs to one of the Global Biodiversity Hotspots, little is known about its fungal diversity, and even less about the main genera of wild mushrooms, i.e. *Cortinarius*, *Lactarius*, *Lactifluus*, *Hericium*, *Boletus*, *Suillus*, *Amanita*, *Russula*, etc. In continuation with the macrofungal exploration (initiated since 2008) of this state of Sikkim by Botanical Survey of India, survey, collection, characterization, identification and documentation of the diverse mycobiota of mushrooms of North district is being proposed.

Area and locality of the Allotted Project : 4226 sq. km; North District of the State of Sikkim being located in Eastern Himalaya.

Summary of the work done during 2014-15 : One macrofungal exploration tour to different parts of Subtropical to Subalpine areas of North and East Districts of Sikkim from 18.07.2014 to 10.08.2014 especially, in Lachen, Zemal-IV, Samthang South, Churten, Bey and surrounding areas

Russula thingbaensis K. Das & S.L. Miller

was undertaken. In total 36 samples (field nos.) belonging to 35 species were collected. Macromorphological characterization (in the field) followed by micromorphological characterization (in the laboratory) of different groups of wild mushrooms belonging to Ascomycota and Basidiomata in connection with the allotted AAP project entitled "Studies on Wild Mushrooms of North Sikkim" were executed. In total 54 field nos. belonging to 44 species were identified. For the preparation of final project report (project 1) the description, photographic and drawing illustrations of specimens belonging to Strophariaceae, Tricholomataceae, Hericiaceae, Russulaceae, Boletaceae, Agaricaceae, Cantharellaceae, Hygrophoraceae, Bondarzewiaceae, Cortinariaceae, Hypocreaceae etc. were made. Undertaken SEM-study of 18 basidiospores of wild mushrooms collected from North district of Sikkim.

Achievements/ Outcomoes in 2014-15 : The present study reports 7 (seven) new species (new to science) namely, 1) *Cyathust hindii* K. Das, Hembrom, A. Parihar & R.L. Zhao; (*Collected from AJCBIBG*) 2) *Bondarzewia zonata* K. Das, A. Parihar & Hembrom; 3) *Austroboletus olivaceoglutinosus* K. Das & Dentinger; 4) *Boletus lakhanpalii* K. Das, D. Chakr., A. Baghela, S.K. Singh & Dentinger; 5) *Russula shingbaensis* K. Das & S.L. Miller; 6) *R. thindii* K. Das & S.L. Miller; 7) *Lactarius vesterholtii* K. Das & D. Chakr.

Besides, 3 species namely, *Astraeus odoratus* Phosri, Watling, M.P. Martin & Whalley; *Gyrodonitium sacchari* (Spreng.) Hjortstam, *Borofutus dhakanus* Hosen& Zhu L. Yang reported as new to India; *Cortinarius flammeus* Berk. rediscovered

4. Project : Project: Liverwort and hornwort flora of Sikkim

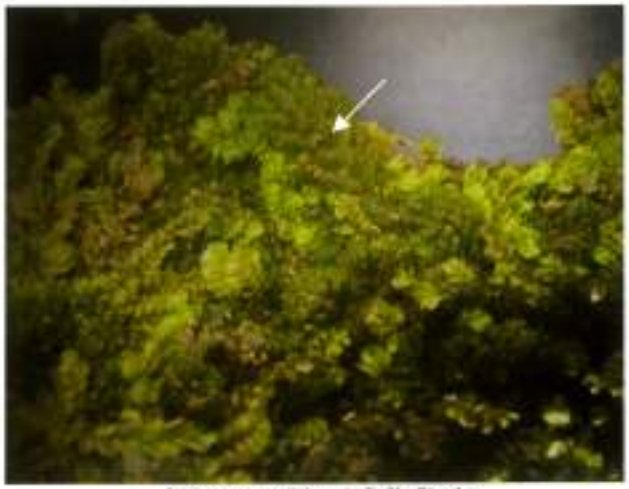
Executing Scientist(s) : Dr. D. K. Singh
Dr. Devendra Singh

Date of initiation : 01 April 2011

Date to be completion : 31 October 2014

Background of the Project : Sikkim, one of the smallest States in the North-east India, spread over 7,096 sq. km. A variety of ecosystems met here support a rich growth of bryophytes, including liverworts and hornworts, both in luxuriance and species diversity.

As part of Eastern Himalayan biotic province, Sikkim has received considerable general attention from Asian and European bryologists for over last 150 years, yet no focussed attention was apparently given to the taxonomic studies on the liverwort and hornwort of the State. As a result, though the studies on liverwort and hornwort of Sikkim date back to 1861, the information available on the liverwort and hornwort of Sikkim not only remains largely



Folioceros paliformis D.K. Singh

scattered, but a considerable part of the same has also become obsolete in view of the evolving concepts in the taxonomy of a number of genera and families recorded from the State. Except for the taxa covered in a series of revisionary studies carried out on Indian, or the Himalayan liverworts in the recent past like Amakawa (1964), Inoue (1963, 1964a, 1964b, 1965a, 1965b), Srivastava (1964), Miller (1965), Singh (1966), Mizutani (1971), Srivastava and Udar (1975a, 1975b, 1976), Udar and Kumar (1981a, 1981b, 1982, 1983) Udar and Awasthi (1982a, 1982b, 1983), Awasthi (1986), Awasthi and Srivastava (1987), Bischler-Causse (1989), Asthana and Srivastava (1991), Sharma and Srivastava (1993), Asthana et al. (1995), Srivastava and Dixit (1996), Awasthi et al.(2000), Srivastava and Srivastava (2002), Asthana and Srivastava (2003), Schill and Long (2003), Rawat and Srivastava (2007), which included a number of species from the State of Sikkim, the morphological details of most of the remaining species are lacking and, therefore, of limited taxonomic use. The present study, therefore, proposes to bridge this gap in our knowledge about the liverwort and hornwort of Sikkim through systematic bryological exploration and morphotaxonomic investigations, including the use of such modern taxonomic tools as scanning electron microscopy, wherever required.

Area and locality of the Allotted Project : Sikkim

Summary of the work done during 2014-15 : During this period, 234 specimens belonging to 108 species, collected from Sikkim, were identified, 96 species have been illustrated, described and microphotographs were taken. About 92 specimens received from Edinburgh herbarium on loan (E), 18 from Japan (NICH), and 02 from London, (BM), 03 from New York (NY) and various others from Lucknow (LWG) and (LWU) were studied and microphotograped sporoderm / elateroderm/ leaf surface of 56 species of liverwort and hornwort under SEM. Manuscript of 'Liverwort and hornwort flora of Sikkim was submitted.

Achievements/Outcomes in 2014-15 : The present study reports 04 species new to the state of Sikkim, *viz. Bazzania angustistipula* N. Kitag., *Cheilolejeunea osumiensis* (S.Hatt.) Mizut., *Plagiochila biondiana* C.Massal., *Radula retroflexa* Taylor, while 9 species *Haplomitrium gibbsiae* (Steph.) R.M.Schust., *Porella obtusata* (Taylor) Trevis.var. *macroloba* (Steph.) S.Hatt. & Zhang, *Radula madagascarensis* Gottsche, *Pallavicinial yellii* (Hook.) Carruth., *Calypogeia udarii* Das & D.K.Singh, *Solenostoma flagellaris* (Amakawa) Váòa & D.G. Long, *Prasanthus suecicus* Lindb., *Folioceros palifornis* D.K. Singh, *Riccia sorocarpa* Bisch. new to India.

5. Project : Revision of family *Metzgeriaceae* in India and data-basing liverworts & hornworts specimens of CAL.

Executing Scientist : Dr. Devendra Singh

Date of initiation : 01 January 2015

Date to be completion : 31 March, 2018

Background of the Project : The family Metzgeriaceae in India comprises in 24 species and 02 varieties and most of the species have been eastblished on the basis of only vegetative characters and various workers have different opinion morphologically in relation to two genera of the family and their taxa.Therefore, it is proposed to study the detail morphological study including the scanning electron microscopy on the basis of own collection and different Indian and forgien herbaria including the type/authentic specimens of each species.

Area and locality of the Allotted Project : Whole India

Objectives : Identification, taxonomic description and camera lucida illustrations of the species of family Metzgeriaceae. Study of type/authentic specimens received/to be received on loan from foreign herbaria. Data-basing of liverworts and hornworts specimens of CAL, Cryptogamic herbarium

Summary of the work done during 2014-15 : During the period identified 12 specimens belonging to 04 species from CAL herbarium and 04 species have been illustrated, described and microphotographs were also taken, studied 02 specimens received from Japan (NICH) herbarium. Prepared data base of 460 specimens of CAL herbarium. During the period, 04 species *Apometzgeria pubescens* (Schrank), Kuwah., *Metzgeria leptoneura* Spruce, *Metzgeria macrocellulosa* Kuwah., *Metzgeria lindbergii* Schiffn. have been described, illustrated and microphotographed for the 'Revision of family Metzgeriaceaein India'.

6. Project : Wood rotting Fungi of Rajmahal hills, Jharkhand

Executing Scientist : Manoj Emanuel Hembrom

Date of initiation : 2013

Date to be completion : 2017

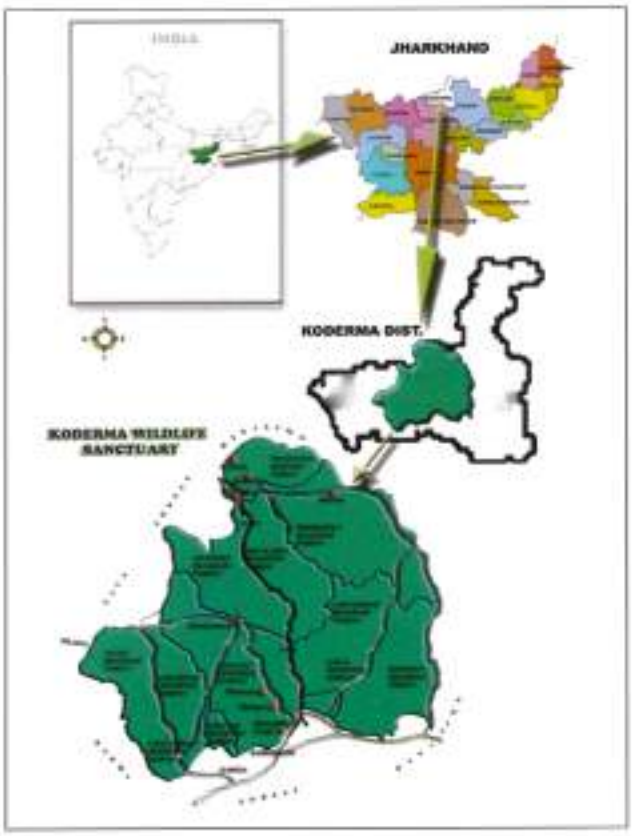
Background of the Project : This area is one of the richest store houses of fossil, flora and fauna preserved by the Mother Nature and finest fields for geologist and paleo-botanist and hence described as "classic ground for the study of Indian geology" (O'Malley, 1910). The areas are well botanized by the workers like Hanes, Bodding and Panigrahi but unfortunately, mycoflora of this region are always remained neglected except sporadic collection of Sulpiz Kurz (1876), then curator of Indian Botanic Garden, Howrah; few Mushrooms collected by Rev. P. O. Bodding, a Norwegian missionary (1940) and former BSI scientist of G. Panigrahi successively. In order to fulfil this gap and partial contribution to vast range of fugal group, a survey, collection, characterization, preservation and identification of wood-rotting fungi of Rajmahal Hills, project were undertaken.

Area and locality of the Allotted Project : Rajmahal hills are spread at Jharkhand state and falls under four districts of Sahibganj, Godda, Pakur and Dumka and covering approx. 2,600- 3000 sq km of hilly areas lies, between 24°15' to 25°15' North latitude and between 87°20' to 87°45'East longitude.

a. *Ganoderma elegantum* Ryvarden;
b. *Perenniporia bambusicola* Choeyklin, T. Hatt. & E.B.G. Jones

Summary of the work done during 2014-15 : During this study, 44 specimens were identified, some of which are *Amylosporus campbellii* (Berk.) Ryvarden, *Antrodia serialis* (Fr.) Donk, *Antrodiella fissiliformis* (Pilšt) Gilb. & Ryvarden, *Aurificaria shorae* (Wakef.) Ryvarden, *Beenakia fuliginosa* (Mass Geest.) Parmasto & Ryvarden, *Fulvifomes glaucescens* (Petch) Y.C.Dai, *Fulvifomes inermis* (Ellis & Everh.) Y. C. Dai, *Funalia caperata* (Berk.) Zmitr. & V. Malysheva, *Ganoderma stipitatum* (Murrill) Murill, *Hexagonia tenuis* (Hook.) Fr., *Lenzites elegens* (spreng.) Pat., *Lenzites stereoides* (Fr.) Ryvarden, *Leucophellinus hobsonii* (Berk. ex Cooke) Ryvarden, *Loweporus tephroporus* (Mont.) Ryvarden, *Microporus xanthopus* (Fr.) Kuntze, *Navisporus floccosus* (Bres.) Ryvarden, *Nigrofomes melanoporus* (Mont.) Murill, *Phanerochaete affinis* (Burt) Parmasto, *Phanerochaete velutina* (DC.) P. Karst., *Phylloporia ribis* (Schumach.) Ryvarden, *Pycnoporus sanguineus* (L.) Murill, *Scytinostroma duriusculam* (Berk. & Broome) Donk, *Trametes cingulata* Berk., *Trametes variegata* (Berk.) Zmitr., Wasser & Ezhov.etc.

Achievements/Outcomes in 2014-15 : This study reports two (02) new species to India (*Ganoderma elegantum* Ryvarden, *Perenniporia bambusicola* Choeyklin, T. Hatt. & E.B.G Jones).



Location map of Koderma Wildlife Sanctuary

7. Project : Wood rotting Fungi of Koderma Wildlife Sanctuary, Jharkhand

Executing Scientist : Arvind Parihar
Date of initiation : 2010
Date to be completion : 2014

Background of the Project : Koderma Wildlife Sanctuary, Jharkhand is situated in the District-Koderma which is spread over an area of 150.62 sq. km., dominated mainly by the dry deciduous sal forest and is unexplored from the mycological point of view. The primary objectives of the Botanical Survey of India is exploration, inventorization and documentation of diversity of protected areas, hence this project was taken for the survey and documentation of Wood rotting fungi of Koderma wildlife sanctuary. During 2010-2014, four collection tours were undertaken and samples were collected from the different areas of sanctuary.

Area and locality of the Allotted Project : Koderma District lies in the Chhotanagpur Plateau at 397 m above the sea level. Koderma Wildlife Sanctuary lies between 24°25' and 24°38' N Latitudes & 85°25' and 85°40' E Longitudes and spread over an area of 150.62 sq. km. It falls in the bio-geographical region of Deccan Peninsula in Chotanagpur Plateau Province.

Summary of the work done : The survey work was completed in September 2013 and most of the specimens were identified. The preparation of photo-plate/Drawings and descriptions of the 45 species was completed; some of which are1. *Amylosporus campbellii* (Berk.) Ryvarden, 2. *Antrodia serialis* (Fr.) Donk, 3. *Antrodiella fissiliformis* (Pilšt) Gilb. & Ryvarden, 4. *Aurificaria shorae* (Wake f.) Ryvarden, 5. *Beenakia fuliginosa* (Mass Geest.) Parmasto & Ryvarden, 6. *Cabalodontia subcretacea* (Litsch.) Pi¹tek, 7. *Ceriporia xylostromatoides* (Berk.) Ryvarden, 8.*Coltricia pyrophila* (Wakef.) Ryvarden, 9. *Coriolopsis brunneoleuca* (Berk.) Ryvarden, 10. *Datronia mollis* (Sommerf.) Donk, 11. *Duportella tristicula* (Berk.& Broome) Reinking, 12. *Earliella scabrosa* (Pers.) Gilb. & Ryvarden, 13.*Favolus tenuiculus* P. Beauv., 14. *Flavodon flavus* (Klotzsch) Ryvarden, 15. *Fomitopsis feei* (Fr.) Kreisel, 16. *Fulvifomes durissimus* (Lloyd) Bondartseva & S. Herrera, 17. *Fulvifomes glaucescens* (Petch) Y.C.Dai, 18. *Fulvifomes inermis* (Ellis & Everh.) Y. C. Dai, 19. *Funalia caperata* (Berk.) Zmitr. & V. Malysheva, 20. *Funalia polyzona* (Pers.) Niemelä, 21. *Funalia sanguinaria* (Klotzsch) Zmitr. & V. Malysheva, 22. *Fuscoporia rhabarbarina* (Berk.) Groposo, Log.-Leite & Góes-Neto, 23. *Fuscoporia senex* (Nees & Mont.) Ghob.-Nejh., 24. *Ganoderma applanatum* (Pers.) Pat., 25. *Ganoderma curtisii* (Berk.) Murrill, 26. *Ganoderma lucidum* (Curtis) P. Karst., 27. *Ganoderma stipitatum* (Murrill) Murill, 28. *Hexagonia tenuis* (Hook.) Fr., 29. *Irpex lacteus* (Fr.) Fr., 30. *Junghuhnia nitida* (Pers.) Ryvarden etc.

DECCAN REGIONAL CENTRE, HYDERABAD

1. Project : Flora of Seshachalam Biosphere Reserve, Andhra Pradesh, India

Executing Scientist(s) : Dr. P. V. Prasanna
Dr. M. Sankara Rao

Date of initiation : 01 April 2012

Date to be completion : 31 March 2017

Background of the Project : Floristic studies on Protected Areas.

Area and locality of the Allotted Project : Seshachalam Biosphere Reserve (SBR), designated in 2011, is located in Seshachalam Hill ranges of the Eastern Ghats, lying between 13°38' - 13°55' N latitudes and 79°07' -79°24' E longitudes. It has spread in Chittoor and Kadapa districts of Southern Andhra Pradeshinan area of 4,755.997 sq. km.The biosphere reserve consists of 638 forest beats.

Summary of the work done during 2014-15 : During this period, four plant exploration tours w.e.f. 06.04.2014 to 20.04.2014; 26.08.2014 to 11.09.2014; 9.11.2014 to 20.11.2014 and 12.03 2015 to 22.03.2015 have been undertaken to Seshachalam Biosphere Reserve, Andhra Pradesh, India and 329 field numbers were collected along with 150 photographs.A total of 203 species were documented from the earlier collections. A good number of RET species namely, *Cycas beddomei* (Cycadaceae), *Syzygium alternifolium* (Myrtaceae), *Terminalia pallida* (Combretaceae), *Pimpinella tirupatiensis* (Apiaceae), *Boswellia ovalifoliolata* (Burseraceae), *Glochidion tirupathiense* (Euphorbiaceae) and *Rhynchosia beddomei* (Fabaceae) etc were collected from the study area.

Cycas beddomei Dyer

Achievements/Outcomes in 2014-15 : This study reports one new species of *Brachystelma.*

2. Project : Flora of Nagarjunasagar Srisailam Wild Life Sanctuary (Tiger Reserve).

Executing Scientist(s) : Dr. L. Rasingam
Dr. M. Sankara Rao

Date of initiation : 01 April 2012

Date to be completion : 31 March 2017

Background of the Project : Floristic studies on protected areas.

Area and locality of the Allotted project: Nagarjunasagar Srisailam Wildlife Sanctuary (Tiger Reserve) is located between latitudes 15° 53' - 16° 43' N and longitudes 78° 30' - 79° 28' E in the Eastern Ghats. It is the largest Tiger Reserve of India, spread in an area of 3568 sq km in 5 districts viz., Nalgonda, Mahaboobnagar of Telangana state and Kurnool, Prakasam and Guntur of Andhra Pradesh.

Summary of the work done during 2014-15 : Two plant exploration tours have been undertaken to Nagarjunasagar Srisailam Wildlife Sanctuary from 19th to 24th September 2014 and 12th to 24th December, 2014. A total of 265 field numbers were collected and 180 photographs taken. One herbarium consultation tour has been undertaken to S.K. University, Ananthapur from 5th to 8th January 2015 and listed all specimens from Euphorbiaceae to Poaceae collected from NSTR.106 species were documented from the earlier collections.

Achievements / Outcomes in 2014-15 : Few RET species, namely, *Heterostemma deccanense* (Apocynaceae), *Andrographis beddomei* (Acanthaceae), *Euphorbia senguptae* (Euphorbiaceae), *Euphorbia deccanensis* var. *nallamalayana* (Euphorbiacae) and *Drimia nagarjunae* (Asparagaceae) were collected from the area.

3. Project : Flora of the sacred groves of Andhra Pradesh

Executing Scientist(s) : Dr. M. Ahmedullah
Dr. M. Sankara Rao

Heterostemma deccanense (Talb.) Swarup. & Mangaly

Date of initiation : 01 April 2012

Date to be completion : 31 March 2017

Background of the Project : Assessment of the sacred areas (groves/sites) protected by local communities.

Area and locality of the allotted project : The erstwhile state of Andhra Pradesh, prior to its bifurcation into the two states of Telangana and Andhra Pradesh, covers a total area of 275,069 sq km, which is roughly 8.37 percent of the total land area of the country. The State is situated between 12° 37'N - 19° 55'N latitudes and 76° 45'E - 84° 46'E longitudes. The entire area comprises three major physiographic regions: (i) the Nallamalai and Erramalai hill ranges of Rayalaseema along with the E. Ghats, (ii) The plateau area (with altitudinal range of 10-1000 m) covering most of Telangana, and (iii) the delta areas between the Krishna and Godavari rivers and the sea coast.

Summary of the work done 2014-15 : Four field tours have been undertaken to Vizianagaram (Chitrakonda Badavalasa and Gorada) Visakhapatnam (Modakonda and Uppa) East Godavari (Peddakonda, Puttagandi Perakavalasa and Rampa) and West Godavari (Gadida Boru, Gubbalamangama and Jeelkaragutta) districts. A total of twelve prioritized sites in the above mentioned four districts were covered and 214 field numbers were collected. Besides 100 photographs were also taken and identified.

Achievements / Outcomes in 2014-15 : Identified all the species collected from the study areas and detailed assessments were made in separate data sheets designed to cover all the parameters required for evaluating each sacred grove from the conservation perspective. *Desmodium zonatum* (Fabaceae) has been found to be a new record for the Eastern Ghats.

View of Papavinasanam Sacred Grove, Chittoor district, Andhra Pradesh

1. Project : Bryoflora (Hepaticae & Anthocerotae) of Mizoram

Executing Scientist : Dr. S. K. Singh

Date of initiation : 01 April 2008

Date to be completion : 30 September 2014

Background of the Project : The literature survey reveals that the botany of the state is not of adequate attention in the past. As far as the studies on Liverwort and hornwort is concerned, the present project is pioneer work as there were no previous report of Liverwort and hornwort from the state except the few publications made by the author (Singh & Barbhuiya, 2011, 2012, 2013; Barbhuiya & Singh 2011a,b, 2012) during the present work, hence document of the liverwort flora is very much needed to fulfil gap of knowledge towards this primitive group of plants.

Area and locality of the Allotted Project : The State of Mizoram located between 21°57' - 24 °30' N latitude and 92° 15' - 93° 29' E longitude, covering 21,081 sq. km of land area. The state shares two international boundaries with Myanmar, Bangladesh.

Summary of the work done during 2014-15 : Identified 298 samples belonging to 105 species and taxonomic description & Illustration prepared for 26 species; The sporoderm pattern of 12 sporiferous materials are studied under SEM. Report submitted, having correct nomenclatural citation of 296 taxa, distribution within India and world along with taxonomic description of 140 species and 90 line drawings.

Achievements / Outcomes in 2014-15 : The following plant species documented during 2014-15: *Acrolejeunea emergens* (Mitt.) Steph., *Archilejeunea planiuscula* (Mitt.) Steph. , *Cheilolejeunea ghatensis* G. Asthana, S.C. Srivast. & A.K. Asthana, *Cheilolejeunea obtusifolia* (Steph.) S. Hatt., *Cheilolejeunea trapezia* (Nees) Kachroo& R.M. Schust., *Cololejeunea cordiflora* Steph., *Cololejeunea desciscens* Steph., *Cololejeunea diaphana* A. Evans, *Cololejeunea follicola* S.C. Srivast. & G. Srivast., *Cololejeunea furcilobulata* (Berrie & E.W. Jones) R.M. Schust., *Cololejeunea haskarliana* (Lehm. & Lindenb.) Schiffn., *Cololejeunea jelinekii* Steph., *Cololejeunea kashyapii* Udar & G. Srivast., *Cololejeunea lanciloba* Steph., *Cololejeunea minutissima* (Sm.) Schiffn., *Cololejeunea madothecoides* (Steph.) Benedix, *Cololejeunea platyneura* (Spruce) A. Evans, *Frullania campanulata* Sande Lac., *Frullania gracilis* (Reinw.,Blume&Nees) Dumort., *Frullania physantha* Mitt., *Jubula hattori* Udar & V.Nath, *Radula acuta* Mitt., *Radula auriculata* Steph., *Radula fulvifolia* (Hook. f. & Taylor) Gottsche, Lindenb. & Nees, *Radula javanica* Gottsche, *Radula lindbergiana* Gottsche ex Hartm.

Interesting Findings : Resurrection: *Cololejeunea indica* Pandé & Mishra.

New to India : *Bazzania hainanensis* L.P. Zhou & L. Zhang, *Plagiochila ptychanthoidea* Steph.

New to Himalaya : *Cololejeunea epiphylla* G. Asthana & A.Shukla.

New to Mizoram : *Cololejeunea gottschei* (Steph.) Mizut.

2. Project : Checklist of Flora of Nagaland

Executing Scientist(s) : Dr. A. A. Mao
Dr. N. Odyuo
Shri D. Verma

Date of initiation : 01 April 2014

Date to be completion : 31 March 2016

Background of the Project : Plant collections from Nagaland state bordering Myanmar dates back to 1820 - 1946 during the British era and for many years remained unexplored. These fragmentary records were the only source of information about the flora of Nagaland. Recollection of Plants from Nagaland started after the establishment of Botanical Survey of India, Eastern Circle, Shillong. The present project aims to document all the collections so far made from Nagaland. This, will be useful to present and future researchers about the Flora of Nagaland at a glance without exploring all the fragmentary information's.

Area and locality of the Allotted Project : Nagalnad lies between 26°6'-27°4' latitudes and 93°20'-95°15' longitudes. It borders on the north by Arunachal Pradesh state, on the south by Manipur state, on the east by Myanmar and the

Chiloschista parishii Seidenf.

west by Assam state. It has a geographical area of 16,575 sq. km, out of which ca 8629 sq. km is a forested area (according to Nagaland Forest Department census 2001).

Summary of the work done during 2014-15 : Based on available literature 1114 taxa tentatively listed so far with current nomenclature and distribution.

Achievements / Outcomes in 2014-15 : Literatures consulted related to the Flora of Nagaland and listed 1114 with updated nomenclature, distribution and local name/s wherever available.

3. Project : Flora of Amchang Wild Life Sanctuary, Kamrup District, Assam

Executing Scientist(s) : Dr. A. A. Mao
Mrs. Nandita Sarma

Date of initiation : 01 April 2014

Date to be completion : 31 March 2017

Objective : To document the Floral diversity of Flora of Amchang Wildlife Sanctuary and to highlight the plant Wealth of the protected area along with threats etc. and conservation measures proposed.

Area and locality of the Allotted Project : Amchang Wildlife Sanctuary covering of an area of 78.64 sq. km. located in the Kamrup District of Assam. The WLS comprises three reserve forests viz., Amchang reserve forest, South Amchang reserve forest and Khanapara reserve forest. It lies between 91°50'N- 91°59'N and 26°13'E- 26°09'E and altitudinal ranges are 60.42 m to 312.15 m. Geographically the area is a continuation of the Khasi and Jaintia hills of Meghalaya and forms a part of Shillong Plateau. The vegetation in the sanctuary is predominantly semi-evergreen and moist deciduous type with secondary growth of *Shorea robusta, Tectona grandis, Bambusa* sp., *Musa* sp., *Calamus* sp., etc.

Summary of the work done during 2014-15 : Two field tours were carried out in the Sanctuary. In 1st tour from 04.12.2014 to 15.12.2014 and collected Field No. 275 (133801-13475) and 2nd tour from 16.03.2015 to 27.03.2015 and collected Field No. 125 (134075-134100, 136301-136400). Identified 45 species collected from previous tour and documented 16 species from Amchang Wildlife Sanctuary. Besides 650 photographs were also taken.

4. Project : Flora of Eastern Nagaland : Mon, Tuensang, Kiphire and Longleng Districts

Executing Scientist(s) : Dr. N. Odyuo
Dr. Ranjit Daimary

Date of initiation : 01 April 2014

Date to be completion : 31 March 2019

Sauromatum horsfieldii Miq.: A. Plant in situ; B. Inflorescences; C. Lower half of Plant.

Objective : To document the Floral diversity of the vascular plants of the Flora of Eastern Nagaland (Mon, Tuensang, Kiphire and Longleng Districts) and to highlight the plant Wealth of the area along with threats etc. and conservation measures proposed.

Background of the Project : Eastern Nagaland is an unexplored and most floristic diversity rich area of Nagaland state in Northeast India. So phytogeographically the area is most important and interesting.

Area and locality of the Allotted Project : The total geographical area of Eastern Nagaland is 8335 sq.km. The area is located in eastern part of Nagaland state and is about 100 km distance away from state capital Kohima. The area is bordering Myanmar in eastern part, Arunachal Pradesh in northern part, Assam in western part.

Summary of the work done during 2014-15 : During the period, two field tours undertaken and collected 729 numbers of herbarium specimens, 166 number of live specimens and around 550 photographs. The collected live plants have been introduced in Botanical Garden, BSI, ERC, Shillong. Forty five species have been identified. The remaining specimens are under process.

5. Project: Flora of South Garo Hills District, Meghalaya with reference to Siju Wildlife Sanctuary, Baghmara Pitcher Plant Wildlife Sanctuary and Balpakram National Park

Executing Scientist : Shri Dilip Kumar Roy

Date of initiation : 01 April 2012

Date to be completion : 31 March 2016

Objective : To document the Flora of South Garo Hills District, Meghalaya with reference to Siju Wildlife Sanctuary, Baghmara Pitcher Plant Wildlife Sanctuary and Balpakram National Park and to highlight the plant Wealth of the area along with threats etc. and conservation measures proposed.

Background of the Project : The South Garo Hills district is one of the highest forest coverage (64.11%) districts of Meghalaya, witness a dominant tropical climatic condition which supports the luxuriant growth of vegetation. The proposed area is a part of Indo-Myanmar realm and has a wide range of Flora and Fauna diversity with a mixture of Asiatic and Indian Peninsular elements. The district has biologically significances due to having one national park viz. Balpakram N.P. and two wildlife sanctuaries viz. Siju WLS and Baghmara Pitcher Plant WLS. So far floristic study of South Garo Hills District in general and the Protected Areas in particular is concerned, a few sporadic works have been done. So, the present work has been undertaken for survey and documentation of the plant biodiversity with reference to the conservational strategies, taxonomic and economic utilization

Area and locality of the Allotted Project : The district – South Garo Hills lies between 25° 25' N to 25° 27' N Latitude and 90° 30' E to 90°66' E Longitude extending an area of 1850 sq. km with 1186 sq. km of forest coverage having Balpakram-Baghmara Landscape in its heart. The district has four protected areas managed by the Meghalaya Forest Department viz. Balpakram National Park (220km^2), Siju Wildlife Sanctuary (5.2km^2), Baghmara Reserve Forest (44.29km^2) and Rewak Reserve Forest (~4km^2) come under Balpakram-Baghmara Landscape.

Summary of the work done during 2014-15 : 03 (Three) field tours were conducted in South Garo Hills covering an area of Balpakram National Park, Siju Wildlife Sanctuary and Baghmara Pitcher Plant WLS and two Reserve forests (Rewak RF and Baghmara RF) fall under Baghmara-Balpakram Landscape. Surveyed about 175 sq. km. areas and collected 430 Field nos. of plant samples. Total 283 taxa have been identified and taxonomic description made for 117 taxa (collected from the area previously (2013-14) and current (2014-15) financial years. The checklist flora of Siju Wildlife Sanctuary is finalized and published and of Balpakram NP is under process. *Impatiens mengtszeana* Hook. f. (Balsaminaceae) has been Lectotypified and the mss is in press (*J. Jpn. Bot*). During floristic works efforts were also taken to document the traditional knowledge of Garo peoples associated with herbal remedies. A manuscript on Garo medicinal plants is under process containing 105 plant taxa with their local names, parts used, methods of preparation and mode of administration. An abstract has been published on Garo Herbal medicines in a National Conference Proceeding. Moreover, one research paper on Garo medicinal plants is also presented in the National Conference. In course of floristic survey in said protected areas, the forest types and altitudinal variation of the vegetation, probable anthropogenic threats to the forests and the plant species were thoroughly observed and documented for inclusion in the District Flora of South Garo Hills District for conservational point of view. Ecological parameters of RET, Endemic and important medicinal plant taxa found in the Protected areas were also documented along with GPS data for mapping of their areas of occurrence and extend of distribution for conservational purposes.

Achievements / Outcomes in 2014-15 : Plant species documented in 2014-15: Identified total 282 taxa (Angiosperm 267 taxa, Gymnosperm 1 taxa and Pteridophytes 14 taxa) and taxonomic description made for 117 taxa (Angiosperms 104 taxa and Pteridophytes 13 taxa).

Interesting Findings :

- New to Science: Three new taxa were discovered and described; of these two taxa have been published viz. *Sauromatum meghalayense* D.K. Roy, A.D. Talukdar, B. K. Sinha & M. Dutta Choudhury and *Molineria prainiana* Deb var. *josephii* D. K. Roy, D. Verma & A. D. Talukdar and one *Zingiber* sp. has been accepted for publication (*J. Jap. Bot., in press*).
- New to India: *Ormosia pinnata* (Lour.) Merr. and *Ormosia fordiana* Oliv. were reported as new additions to the Flora of India.

Sauromatum meghalayense D.K. Roy, A.D. Talukdar, B. K. Sinha & M. Dutta Choudhury

- New record for State : 35 taxa.
- Rediscovered: One endemic taxa *Trigonostemon viridissimus* var. *chatterjii* (Deb & G.K. Deka) N.P. Balakr. & Chakrab. recollected after type and evaluated its IUCN status as vulnerable following the IUCN Red List Categories and Criteria and communicated for publication (mss in press, *J. Science Research Reporter* 5(2) : 09-13.2015).
- Ethnobotanical Information: Total 105 Garo-medicinal plants have been documented along with their different use patterns and administration. The Informant Consensus Factor (F_{IC}) and Fidelity Level (*FL*) of the Garo-medicinal plants have been evaluated to understand the high occurrence of any kind of diseases in Garo Hills.
- Rare, Endangered and Economic important plants collected for conservation in Botanical Garden are *Sapindus tetraphyllus, Caulokaempferia secunda, Ormosia robusta, Paphiopedilum venustum, Paniseatri callosa, Podochilus cultratus, Cymbidium aloifolium, Bulbophyllum reptans* and *Agrostophyllum khasianum.*

6. Project : Flora of Yangoupokpi Lokchao Wildlife Sanctuary, Chandel District, Manipur.

Executing Scientist(s) : Dr. A. A. Mao
Shri L. R. Meitei

Date of initiation : 01 April 2014

Date to be completion : 31 March 2018

Objective : To document the Flora of Yangoupokpi Lokchao Wildlife Sanctuary, Chandel District, Manipur and to highlight the plant Wealth of the protected area along with threats etc. and conservation measures proposed.

Background of the Project : Yangoupokpi Lokchao Wildlife Sanctuary, is located in the Chandel District of Manipur. With an area of 184.80 sq. km, it lies between Latitudes 24° 13'51" N to 24° 26' N; Longitudes 94° 13'51" E to 94° 23'51"E and altitudes 276 m to 888 m. It has unique and vibrant ecosystem representing the rich Indo–Malayan biodiversity hotspot due to location of the sanctuary at the confluence of two major geographical zones. The rich floristic diversity of the wildlife sanctuary is still unexplored.

Area and locality of the Allotted Project : Yangoupokpi Lokchao Wildlife Sanctuary, Chandel District, Manipur (areas 186.4 sq. km).

Summary of the work done during 2014-15 : Two field tours undertaken in 2014-15 of which, 1st tour was undertaken *w.e.f.* 18.12.2014 to 03.01.2015 (total 17 days) covering about 65 sq. km areas of Khujai Lok, Maantum, Lai Lok, Chikim, Lai ching, Moullem Phai, Harmon and Mojang forests and collected 156 field no. with 600 colour photographs and 61 live plant species. Second field tour was undertaken *w.e.f.* 16.03.2015 to 29.03.2015 (total 14 days), covering 85 sq. km areas of Maantum, Leibi, Lai Lok, Laishen Ching, Lai ching, Kwatha, Khudengthabi and Khujai Lok forests of Yangoupokpi Lokchao Wildlife Sanctuary and collected 160 Field no. of plants specimens with 500 colour photographs and 54 live plant species. Identified 63 species collected from the area during the period and documented 28 species.

Live plants collected for ex-situ conservation : 115(61+54) live plants collected for introduction of conservation purpose. Some of them are: *Acampe* spp. (2), *Aerides spp.* (2), *Ardisia* sp., *Begonia* sp., *Boesenbergia* sp., *Bulbophyllum repens, Bulbophyllum* spp. (2),*Calanthe* sp., *Calamus* sp., *Clerodendrum* sp., *Coelogyne* sp., *Costus* sp., *Curcuma* sp., *Cycas* sp., *Cymbidium* spp. (2), *Dendrobium* spp. (2), *Dioscorea* spp. (2), *Dipterocarpus* sp., *Eria biflora, Eria spp.* (2), *Eulophia* sp., *Fern* spp. (2), *Geodorum* sp., *Habenaria* sp., *Hedychium* spp. (2), *Liparis* sp., *Micropera* sp., *Musa* sp, *Pholidota* sp., *Oberonia* spp. (2), *Phalaenopsis* sp., *Pelatantheria insectifera, Pholidota* sp., *Rauwolfia* sp., *Saccolabiopsis* sp., *Sterculia* sp., *Thunia* sp., *Tinospora* sp. *and Zingiber* spp. (2).

Achievements/ Outcomes in 2014-15:

- **New to India:** 1. A new generic record- *Cleisomeria pilosulum* (Gagnepain) Seidenfaden & Garay
- **Rare, Endangered and Economic important plants collected and details of conservation initiations:** *Acamper igida, Aerides odorata, Artabotrys hexapetalus, Bulbophyllum* sp., *Calanthe* sp., *Dendrobium acinaciforme, Dendrobium moschatum, Artabotrys hexapetalus, Cycas pectinata, Dendrobium delacourii, Paphiopedilum* sp., *Phoebe haenesiana, Platycerium wallichii, Renanthera imschootiana* and *Vanda coerulea* falling under the rare/ threatened category were collected and planted in the garden.

Dendrobium delacourii Guillaumin

7. Project : Flora of Laokhowa Wild Life Sanctuary, Nagaon, Assam

Executing Scientist(s) : Dr. Chaya Deori
Shri Satya RanjanTalukdar

Date of initiation : 01 April 2013

Date to be completion : 31 March 2016

Objective : To explore, inventories and to document the Plant wealth of Laokhowa Wildlife Sanctuary Nagaon, Assam with ecological aspects, population status of endemics and GIS mapping.

Background of the Project : Laokhowa Wild Life Sanctuary is situated in the Nagaon District of Assam covering an area of 70.13 sq. km which is a buffer zone of the Kaziranga Tiger Reserve. The Laokhowa Wildlife Sanctuary has a proud legacy of being a protected area for over 80 years, as of today. The Sanctuary being a flood plain of the river Brahmaputra its ecosystem is a unique combination of grassland, wetland, and different riparian forest types. However, having endowed with these potential the Sanctuary is facing grave confrontation with biotic interferences in the form of encroachment of Sanctuary land for cultivation, community ground.

Area and locality of the Allotted Project : Geographically Laokhowa Wild life Sanctuary is located in the central Assam in the southern bank of River Brahmaputra. District wise the Sanctuary is located in the Northern part of Nagaon District of Assam lying 26°30' N to 26°32' N latitude and 92°40' E to92°47' E longitude.

Summary of the work done during 2014-15 : Conducted Three (03) field tours to the area viz., 1st in Quarter 1 (*w.e.f.* 20th -27th June, 2014), 2nd in Quarter 3 (*w.e.f.* 16th to 22nd December 2014) and collected 169 field numbers along with GPS data and 615 digital photographs taken. The 3rd tour was conducted in 4th Quarter on 1st March 2015, for collecting information on migratory birds and 9 (nine) live plant species viz., *Rhynchostylis retusa, Dendrobium aphylum, Zingiber rubens, Gastrochilus obliquss, Cheilocostus speciosus, Zeuxine nervosa, Alocasia acuminata, Alocasia fornicata, Typhonium trilobatum* were collected for introduction in the experimental garden, Barapani. Also identified: 228 species, documented 206 species and 3 varieties from the recent tours. Identification and description for Flora of LWS and draft manuscript completed comprising of 409 plants (405 species, 3 varieties and 1 subsp.). Final Mss will be submitted shortly.

Laiching Forest of Yangoopokpi Lokchao WLS

8. Project: Micropropagation of RET plants of North East India

Executing Scientist(s) : Dr. A.A. Mao
Smt. Kangkan Pagag

Date of initiation : 01 April 2012

Date to be completion : 31 March 2017

Background of the Project : *Ex-situ* conservation of *Armodorum senapatianum, Cymbidium tigrinum, Rhododendron coxianum, Ilex khasiana, Paphiopedilum hirsutissimum.*

Area and locality of the Allotted Project : N.E. India particularly in Meghalaya, BSI, ERC, Shillong.

Summary of the work done during 2014-15 : Completed experiments for micropropagation of *Armodorum senapatianum, Cymbidium tigrinum, Rhododendron coxianum.* Experiment for micropropagation of *Armodorum senapatianum* using MS medium with different additives has been completed and transferred 200 plantlets to greenhouse for hardening in Charcoal: bricks = 3:1 ratio. Subculture of *Cymbidim tigrinum* at regular period was done. 100 plantlets were transferred to Soil : sphagnum in the ratio 3:1. Experiment for multiple shoot induction and callus induction using WPM medium with different concentration of PGRs were completed. Both multiple shoots and callus observed.Using nodal segment of stems of *Ilex khasiana* experiment was initiated. Few shoots developed. An experiment was also done using vegetative parts of *Paphiopedilum hirsutissimum* for multiple shoot induction. Contamination occurred and therefore standardizing the process of surface sterilization.

9. Project: Taxonomic Revision of genus *Riccia* (Mrachantiophyta) in India

Executing Scientist : Dr. S. K. Singh

Date of initiation : 01 October 2014

Date to be completion : 31 March 2019

Background of the Project : Bryophytes, the amphibians of the 'Plant Kingdom', are the second largest group of green plants next only to the Angiosperms. Strategic geographical location and diversified climatic conditions of Indian Territory provides a congenial environment for a speciation and richness in Bryophytes in general and Hepaticae and Anthocerotae in Particular.

The genus *Riccia* is the largest genus of thallose liverwort in India. The members of the genus are very simple in morphology and anatomy and characterized by usually linear or oblong thalli differentiated into photosynthetic and storage zone, with or without simple air pores and the sporophytes embedded in the thallus. They differ from other bryophytes in having fertile plant without involucres, pseudoperianths, seta and elaters and occupy unique position in bryophyte systematics. They are unique in their habits in having tendency of growing in rosettes (a unique feature of the genus). The members of the genus form the part of both undergraduate and post-graduate syllabi and teaching curricula of several Indian Universities. A total of 36 species are considered to be occurring in India and the status of other species is uncertain. Only account on genus is available from India by K.P. Srivastava (1964) which dealt with 17 species in details. Further, many taxonomical changes have been done in applying the rules of botanical nomenclature and as such no comprehensive monographic account is available at present. To fill this gap of knowledge the revisionary studies on the genus proposed.

Area and locality of the Allotted Project : Entire India

Summary of the work done during 2014-15 : Study of literature & Herbarium specimens. Field tour (1), Herbarium Study tour (1) undertaken.

Field exploration tour : A field exploration tour was conducted *w.e.f.* 08th-23rd October, 2014 in connection with the Project to different areas of Karnataka & Maharashtra. The area were surveyed Banerugatta, Lalbagh Bot. Garden, Nandi Hills, Mangalore, Pilikula Bot Garden, Uddupi, Kudremukh National Park, Shimoga Shankargatta, Abbi falls, Madikeri, Tadiandamol, Agumbe Ghat 1, MPCA, Jogi Gundi falls in Karnataka and Pune, Purandar Hills, Panchgani, Mahabaleswar (Lingnala falls, Dhobight), Lonawala, Khandala in Maharshtra. Fourty samples of *Riccia* were collected. In addition collected 301 samples of liverwort and hornworts. Preservation of the samples made.

A Herbarium consultaion tour conducted to Kolkata *w.e.f.* 01 Feb. -07 Feb. 2015 and consulted about 19 Issue of Different Journal like Nowa Hedwigia, Bryophytorum Bibliotheca, Journal of Bryology, J. Hattori Bot. Lab., Cryptogamie bryologie, and 3 books at Library of CAL. During the tour studied the *Riccia* specimens viz., *Riccia stricta* (36570, 36648, 36700 Sikkim), *Riccia huebenriana* (36826, 6066 Sikkim), *Riccia sorocarpa* 60668a &*Riccia huebenriana* (60668b Sikkim), ect.

Besides a comparison was made to the different specimens collected from Mizoram viz., *Acanthocoleus yoshinaganus* 119713, *Lejeunea curviloba* 119721, *Plagiochila indica* 119738, *Plagiochasma cordatum* 119743, *Herbertus dicranus* 119765, *Solenostoma comata* 120039, *Heteroscyphus darjeelingensis* 119765, *Drepanolejeunea vesiculosa* 120047, *Plagiochila secretifolia* 120067, *Cololejeunea tenella* 120071, *Cololejeunea pseudofloccosa* 120075, *Cololejeunea spinosa* 120077.

Phanera glauca subsp. *tenuiflora* var. *murlenensis* Ram.Kumar, Bandyop. *et* S. Sharma

Eria merguensis Lindl.

Studied Types and authentic specimens on loan to CAL from different Herbaria viz., *Drepanolejeunea follicola* (HIRO: Syntype) No. 6585, *Plagiochila zangii* (E: Holotype) No. B241, *Drepanolejeunea pulla* (BM syntype) No. 1452, *Drepanolejeunea longii* (E, Isotype) No. 8670, *Drepanolejeunea erecta* (E) No. 26495, 26344, *Drepanolejeunea angustifolia* (E) No. 23020, *Lejeunea angustifolia* (BM) Isotype, No 1498, *Cheilolejeunea turgida* 1498 B(E), *Cololejeunea pseudofloccosa* 8670 B(E), *Cololejeunea tenella* 8670 C (E), *Cololejeunea goebelii* 8670 D(E).

10. Project : Flora of Murlen National Park, Mizoram

Executing Scientist : Dr. Ramesh Kumar
Date of initiation : 01 April 2012
Date to be completion : 31 March 2015

Objective : To explore and document the flora of Murlen National Park, Mizoram. To comply all the information for the preparation of a handbook of flowering plants of Murlen National Park for enabling correct identification of the plant species.

Background of the Project : Murlen National Park is one of the best National Parks of Mizoram in Champhai District bordering Myanmar. Because of its proximity to Chin Hills and by being the part of Indo-Myanmar Hot spot its floral components are significant. A large number of Indo Myanmar elements are available here.

Area and locality of the Allotted Project : Murlen National Park is one of the best National Parks of Mizoram. It lies between 92°27'24" - 93°19'53" E & 23°32'42" - 23°41'36" N in the north-east corner of Mizoram in Champhai District bordering Myanmar. Because of its proximity to Chin Hills and by being the part of Indo-Myanmar Hot spot its floral components are significant. The river Pompet is the only seasonal river runs from west to south and separates core from buffer in west. The total geographical area of the Murlen National Park is 200 sq. km out of which 100 sq. km. come under core and has dense forest and remaining 100 sq. km is buffer has sparsely jhum cultivation.

Summary of the work done during 2014-15 : Final report of the project was submitted to Director, Botanical Survey of India in April 2015 and editing of the flora is under process for publication. One field tours conducted *w.e.f.* 09th – 22nd September 2014 (14 days) and collected 175 field numbers; three local tours and one herbarium consultation tour to CNH undertaken. During field survey Grid map and GPS coordinates of different forest/vegetation patches demarcated with the help of Satellite imagery by using GPS to explore and collect maximum number of plant species and

Paphiopedilum hirsutissimum (Lindl. ex Hook.) Stein

may be important for retrieval of RET species and forest planning of the Protected area as the study area is in Indo-Myanmar Region. Identified 281 species for the Flora of Murlen National Park, Mizoram. Besides, 46 live plants collected from Mizoram and 20 species collected from Meghalaya. Documented 903 species in the area.

Interesting Findings:

- **New to Science :** 01 (One) : *Phanera glauca* subsp. *tenuiflora* var. *murlenensis* Ram.Kumar, Bandyop. *et* S. Sharma.
- **New to India :** 02 (Two) : *Calanthe hancockii* Rolfe and *Eria merguensis* Lindl.
- **New record for region:** New to north-east : 01 (One): *Curcuma latifolia* Roscoe
- **Addition to the Flora of Mizoram :** 29 (Twenty nine): *Curcuma amada* Roxb., *Curcuma prakasha* S. Tripathi, *Parakaempferia synantha* A.S. Rao & D.M. Verma, *Bulbophyllum crassipes* Hook.f., *Crepidium purpureum* (Lindl.) Szlach., *Dendrobium thyrsiflorum* Rchb. f. ex Andre, *Dendrobium stuposum*Lindl., *Dendrobium wardianum* Warner, *Dendrobium williamsonii* Day & *Rchb.f.*, *Gastrochilus obliquus* (Lindl.) Kuntze, *Habenaria reniformis* (D.Don) Hook. f., *Phreatia elegans* Lidl., *Smitinandia micrantha* (Lindl.) Holtt., *Streochillus hirtus* Lindl., *Sunipia andersonii* (King & Pantl.) P.F. Hunt, *Tainia viridifusca* (Hook.) Benth. ex Hook.f., *Vanda pumila* Hook.f., *Bulbophyllum thomsonii* Hook. f., *Digitaria ischaemum* (Schreb.) Muhl., *Digitaria violascens* Link, *Epigeneium naviculare* (M. S. Balakr. & S. Chowdhury) Hynn. & Wadhwa, *Eragrostis curvula* (Schrad.) Nees, *Lopotherum gracile* Brongn., *Oberonia caulescens* Lindl., *Oberonia mucronata* (D. Don) Ormerod & Seidenf., *Oplismenus burmanii* (Retz.) P. Beauv, *Setaria verticillata* (L.) P. Beauv., *Themeda arundinacea* (Roxb.) A. Camus, *Themeda caudata* (Nees ex Hook. & Arn.) A. Camus.
- **Addition to the Flora of Meghalaya :** 02 (Two) : *Globba rubromaculata* J. Lal & D.M. Verma and *Phalaenopsis deliciosa* Rchb. f.
- **Addition to the Flora of Assam :** 01 (One): *Zingiberroseum* (Roxb.) Roscoe.
- **Rediscovery: 02(Two) :** *Arundina graminifolia* var. *revolute* (J.D.Hooker) A.L. Lamb and *Phanera nervosa* Benth.

Agapetes megacarpa W.W.Sm.

AJC BOSE INDIAN BOTANIC GARDEN, HOWRAH

1. Project: Collection, Introduction & Ex-situ Conservation of Rare and Endemic Orchids of NE India

Executing Scientist(s) : Dr. M. U. Sharief
Dr. Basant Kr. Singh

Date of initiation : 2014

Date to be completion : 2017

Targets : Two field tours to Tripura and NE India in Q2 and in Q4 respectively for collection of 10 rare & endemic orchids in each tour.

Work Done : 2 tours; Assam, Meghalaya & Arunachal Pradesh *w.e.f.* 11.09.2014 to 21.09.2014 and Sikkim Himalaya *w.e.f.* 21.03.2015 to 28.03.2015 and 93 orchid species collected and introduced in the Mist Chamber of AJCBIBG for *ex-situ* conservation. Collection, introduction & multiplication of Orchids of Meghalaya & Tripura from 11th to 21st September, 2014 and introduced in AJCBIBG, Howrah are: *Acampe ochracea, Acampe rigida, Acanthephippium bicolor, Aerides odorata, Agrostophyllum brevipes, Anoectochilus roxburghii, Arachnis labrosa, Arundina graminifolia, Bulbophyllum affine, Bulbophyllum guttulatum, Bulbophyllum gymnopus, Bulbophyllum leopardinum, Bulbophyllum odoratissimum, Bulbophyllum retusiusculum, Bulbophyllum rothschildianum, Calanthe masuca, Calanthe triplicata, Coelogyne ovalis, Coelogyne prolifera, Coelogyne stricta, Coelogyne suaveolens, Cymbidium aloefolium, Cymbidium bicolor, Dendrobium anceps, Dendrobium aphyllum, Dendrobium chrysotoxum, Dendrobium denudans, Dendrobium heterocarpum, Dendrobium heyneanum, Dendrobium hookerianum, Dendrobium lindleyi, Dendrobium longicornu, Dendrobium moschatum, Epigeneium fuscescens, Eria bambusifolia, Eria pubescens, Flickingeria macraei, Liparis viridiflora, Malaxis acuminata, Oberonia acaulis, Otochilus albus, Otochilus porrectus, Paphiopedilum hirsutissimum, Paphiopedilum insigne, Paphiopedilum spicerianum, Paphiopedilum villosum, Peristylus lacertifer, Pholidota articulata, Renanthera imschootiana, Schoenorchis gemmata, Trichoglottis* sp., *Vanda coerulea.*

Plant collection tour to Sikkim Himalaya from 21.03.2015 to 28.03.2015: *Acampe ochracea; Acampe rigida, Aerides odoratum, Agrostophyllum brevipes, Agrostophyllum callosum, Bulbophyllum affine, Bulbophyllum careyanum, Bulbophyllum cauliflorum, Bulbophyllum guttulatum, Bulbophyllum* sp., *Chiloschista parishii, Cleisostoma linearilobatum, Coelogyne corymbosa, Coelogyne cristata, Coelogyne fuscescens, Coelogyne nitida, Cymbidium bicolor, Cymbidium longifolium, Dendrobium*

Bulbophyllum rothschildianum (O'Brien) J.J.Sm.

Bambusa tulda Roxb.

amoenum, Dendrobium aphyllum, Dendrobium densiflorum, Dendrobium nobile, Dendrobium ochreatum, Epigeneium amplum, Eria acervata, Eria paniculata, Eria pubescens, Gastrochilus calceolaris, Liparis bistriata, Liparis elliptica, Liparisres upinata, Luisia zeylanica, Oberonia acaulis, Oberonia caulescens, Oberonia pachyrachis, Otochilus albus, Pholidota articulata, Pholidota imbricate, Rhynchostylis retusa and *Vanda cristata.*

2. Project : Survey and Assessment of growing stock of Economic bamboos of West Bengal

Executing Scientist : Dr. Pushpa Kumari

Date of initiation : 2014

Date to be completion : 2017

Targets : Four field tours proposed; first and third field tour in Q1. & Q3 to bamboo rich areas of 24 Parganas (N) and Midnapore Districts and to make an assessment of the growing and available stalks. Second and fourth field tours in Q2.& Q4 to bamboo rich areas of Hooghly, Burdwan and Bankura districts to make an assessment of the growing and available stalks.

Work Done : It was aimed to complete the survey work of 5 districts (24 Parganas, Midnapore, Hooghly, Burdwan, Bankura) in the first year. Two trips with the members of all collaborating units were taken for 24 Parganas districts and one independent trip for Hooghly District was taken for survey and documentation. Subsequently the survey scheduled was revised and limited for 24 Parganas and Midnapore Districts by RKVM and also due to fund not released by DST West Bengal for the said project further survey work could not be taken.

3. Project : Taxonomic Revision of *Bambusoideae* (Poaceae) in India

Executing Scientist : Dr. Pushpa Kumari

Date of initiation : 1 April 2014

Date to be completion : 31 March 2017

Background of the Project : Thorough survey of NE region was done during the AICOPTAX project and with the collection of selective rarely known species from type and restricted localities. The present project "Taxonomic Revision of Bamboos in India" has been taken to provide the current account of the species found and reported from India with identification keys, description, distribution, illustration and photographs.

Area and locality of the Allotted Project : India

Summary of the work done during 2014-15 : During this period, four field tours were conducted to Arunachal Pradesh, Meghalaya (July 2014), Kerala (January 2015) and Andaman & Nicobar Islands to prevent extinction of threatened species. A total of 18 species of bamboos were collected for *ex-situ* conservation in the AJCBIBG along with the samples for herbarium of c. 25 species. Besides, 35 species in different herbaria identified, 400 old herbarium specimens were digitized. A checklist was prepared from all the relevant literature and herbarium specimens housed at different herbaria. The herbaria of ASSAM, ARUN, TBGT and BLATT have been consulted during this year and also herbarium specimens of more than 20 species including flowering of 11 species have been collected from Arunachal Pradesh, Meghalaya, Andaman & Nicobar Islands and Kerala for taxonomic study. Specimens collected in flowering have been studied and dissected parts have been illustrated. Types available at CAL have been studied.

Achievements/ Outcomes in 2014-15 : The present study reports one new variety *Bambusa tulda* Roxb. var. *gamblei* P. Kumari & P. Singh, Rediscovery of *Bambusa pseudopallida* Majumdar, *Schizostachyum kurzii* (a rare bamboo species) collected from Andaman for macro-propagation and is being tried for multiplication, one seedling of *Schizostachyum beddomei* (a very rare species of W. Ghats) was collected from Kerala and kept for acclimatization but it could not survive.

4. Project : Herbaceous Flora (Dicots) of AJCBIBG

Executing Scientist : Dr. B. K. Singh

Date of initiation : 2014

Date to be completion : 2016

Target : Documentation of Dicot Herbaceous Flora of AJCBIBG

Work Done : 350 herbacious (Dicot) plants of AJCBIBG are documented, identified, photographed and collected for identification whenever required. Other field data as habitat, flowering and fruiting time, associated species are also noted.

5. Project : GIS phyto-mapping & digitization of shrubs and trees in AJC Bose Indian Botanic Garden

Executing Scientist(s) : Dr. C. M. Sabhapathy
Dr. A. Pramanik

Date of initiation : 2014

Date to be completion : 2016

Target : Gathering information about the introduction of the tree and shrubs in the past and present from the researchers of BSI and from the Literatures/ Catalogues as

per availability. Locating the trees and shrubs in the garden. Collection of fresh flowering, fruiting specimens and Identifying. Making Digital Plates of all the Significant/ Identifying characters of the collected plant specimens.

Summary of Work done : Prepared the base map for the AJCBIBG with the help of open source softwares such as QGIS, Google earth etc. Standardized the map and minimized the errors up to 10 meters. So far around 280 species i.e., 20 % of the 1400 species and around 3000 trees and shrubs which is approximately 20% of the 14,000 trees and shrubs have been identified and represented in the Mapping software and it is learnt that the best output is still to be achieved. As all the work flow chart has been practised and the possible problems were analysed from time to time, it is expected that the remaining work shall be completed with the increase in scientific support for identification of the species in the Garden.

Achievements : As a trial, the recorded plant coordinates were tested by interested users in the Operating System such as Android OS, MS Windows with the selected software such as GPX viewer, QGIS, Google earth and gave venues for user in friendly way. Further, the process of reducing the errors is being achieved by multiple approaches viz., physically verifying by measuring the distance, creating the standardized land marks etc. There were around 50 *Mangifera* species added to the existing records and 50 *Roystonea regia* (Kunth) O. F. Cook were added to the records. The species such as *Kydia calycina* Roxb., was found missing in the said locality and proposed for reintroduction in the Garden.

6. Project : Indigenous Palms of India

Executing Scientist : Dr. S. S. Hameed

Date of initiation : 2012

Date to be completion : 2015

Target : Two tours in Q3 (Arunachal Pradesh & Meghalaya *w.e.f.* 10.10.2014 to 23.10.2014) and in Q4 North India (Uttarakhand (North India) *w.e.f.* 28.04.2015 to 08.05.2015) respectively for collection of ca. 15 species of palms.

Work done : 19 species of Palms and 40 other important plant saplings were collected and introduced in the Nursery. List of plants/seeds/propagules collected from Arunachal Pradesh & Meghalaya. Indigenous palms species collected from the area are: *Areca triandra, Calamus erectus, Calamus* sp.,*Calamus* sp.,*Calamus tenuis, Caryota obtuse, Caryota rumphiana, Livistona jenkinsiana, Phoenix acaulis, Pinanga gracilis, Plectocomia assamica, Trachycarpus martianus, Wallichia densiflora, Wallichia disticha, Wallichia triandra*. Other species are: seedlings of *Elaeocarpus floribundus, Cyathea* sp., *Bambusa polymorpha, Oxytenanthera parviflora, Canarium strictum, Aquilaria malaccensis, Terminalia myriocarpa, Podochilus khasianus, Magnolia thomsonii, Nephenthes khasiana* and *Tacca* sp.

Palm species collected from Uttarakhand (North India) are *Phoenix humilis* var *robusta, Phoenix sylvestris, Trachycarpus takil,*

7. Project : Ex situ Conservation of Bamboos of India

Executing Scientist : Dr. Pushpa Kumari

Date of initiation : 2012

Date to be completion : 2017

Target : Two field tours in Q1 and in Q3 to North East region and southern region (Kerala) and Andaman & Nicobar Island for repoet of flowering in Bamboo species. Survival status of introduced species in previous years. Introduction of ca. 10 spp. of bamboo in the garden.

Work Done : Name of species collected for ex-situ conservation from Andaman Island, Arunachal Pradesh, Assam & Meghalaya: *Bambusa pallida, Stapletonia arunachalense, S. seshagirianum, Bambusa mastersii, Neohouzeaua dullooa, Gigantochloa andamanica, G. nigrociliata, Dinochloa andamanica, Schizostachyum andamanicum, S. kurzii* and *Pseudostachyum polymorphum*

8. Project : Development of Division No. 25 of AJC Bose IBG

Executing Scientist(s) : Dr. A. Pramanik

Dr. H.S. Mahapatra

Date of initiation : 2012

Date to be completion : 2017

Target : One tour to North East India Mungpoo, Darjeeling district w.e.f. 22.11.2014 to 28.11.2014) for collection of *Cinchona, Ipecac* and *Citrus.*

Work Done : 30 species of RET and economically important plants were collected from Mungpoo, Darjeeling district from 22nd - 28th November 2014 for development of 25 No. Division of AJCBIBG. Live plants collected: *Agapetes* sp., *Bambusa* sp., *Camellia sinensis, Cephaelis ipecacuanha, Cinchona ledgeriana, Coelogyne prolifera, Coelogyne* sp., *Cryptomeria japonica, Cymbidium aloefolium, Dendrobium longicornu, Dendrobium macrostachyum, Dendrobium nobile, Exbucklandia populnea, Ginkgo biloba, Persea americana* (Lauraceae), *Pholidoda articulata, Pleione praecox, Taxus wallichiana.*

Seeds collected: *Castanopsis indica, Cephaelis ipecacuanha, Cinchona ledgeriana, Euphorbia cathyrus, Magnolia champaca, Solanum mammosum* and *Trachycarpus fortunei.*

9. Project: Collection, introduction and multiplication of 20 endemic, threatened, medicinal, ornamental and economically important plants.

Executing Scientist(s) : Dr. A. Pramanik
Dr. B. K. Singh

Date of initiation : 2012

Date to be completion : 2017

Target : 20 endemic, economic & threatened species out of 50 EET species to be collected from two tours to be taken up in Q1 and Q3 in North East India.

Work Done : 2 tours undertaken; first in Assam & Meghalaya w.e.f. 11.09.2014 to 21.09.2014 and second in Arunachal Pradesh w.e.f. 15.02.2015 to 23.02.2015 and collected 58 species of various RET & economically important. Tour to Meghalaya &Assam (11th to 21st September, 2014)

Aerides odorata, Aquilaria malaccensis, Croton tiglium,Cyathea gigantean, Cymbopogon caesius, Dendrobium aphyllum, Dillenia scabrella, Elaeocarpus serratus, Exbucklandi apopulnea, Gnetum gnemon, Lobelia nummularia, Mesua assamica, Panax pseudoginseng, Papilionanthe teres, Solanum macranthum, Tacca integrifolia, Taxus wallichiana, Thunbergia mysorensis, Tragia lassie,Vernonia volkameriifolia, Zanthoxylum khasianum.

Plant collection tour to Itanagar and surrounding areas in Arunachal Pradesh from 15.02.2015 to 23.02.2015 and collected Plants like: *Artocarpus chama, Bulbophyllum lobbii, Bulbophyllum secundum, Bulbophyllum spathaceum,Canarium resiniferum, Chukrasia tabularis,* Coelogyne nitida, *Coelogyne rigida, Coelogyne stricta, Elaeocarpus floribundus, Epigeneium amplum, Eranthemum pulchellum, Flickingeria fugax, Otochilus fuscus, Otochilus porrectus, Livistona jenkinsiana, Clerodendrumt homsoniae, Reinwardtia indica, Homalocladium platycladum, Quercus griffithii, Lagerstroemia speciosa, Phoebe goalparensis, Morus laevigata.*

Total revenue received for providing information/ identification service/photocopy etc. :

		Up to 31st July, 2015
Entry Ticket & Photographic Charges	:	Rs. 67,31,000/-
Boating in the Lakes	:	Rs. 3,90,000/-
Morning Walker Id Card	:	Rs. 2,00,000/-
Sale proceeds of wooden logs	:	Rs. 5,57,035/-
TOTAL	:	**Rs. 78,78,035/-**

(Rupees Seventy eight lakh seventy eight thousand thirty five)

Panoramic view of Kyds lake

INDUSTRIAL SECTION INDIAN MUSEUM, KOLKATA

1. Project : Revision of family Gesneriaceae of NE India.

Executing Scientist(s) : Dr B. K. Sinha
Mrs. Sudeshna Datta

Date of initiation : 01 April 2013

Date to be completion : 31 July 2015

Objective : Detail Study of Gesneriaceae members of NE India

Background of the Project : Gesneriaceae, consisting 147 genera with approximately 2,500 to 3,500 species distributed in the tropical to temperate climate of the world.The family can be conveniently divided into 3 subfamilies and 11 tribes of which two subfamilies are represented in NE India. The present revision is formatted according to this classification and includes 5 tribes and 21 genera 82 species in the states of Nagaland, Manipur, Mizoram, Tripura, Meghalaya, Assam, Sikkim and West Bengal (districts Darjeeling and Jalpaiguri). The total land area of the surveyed area is c. 262,230 sq. km

Area and locality of the Allotted Project : NE parts of India, including states of Sikkim, Assam, Meghalaya, Arunachal Pradesh, Nagaland, Manipur, Mizoram and Tripura.

Summary of the work done during 2014-15 : Completed the description of 11 species such as *Aeschynanthus linearifolius*, *Aeschynanthus mannii*, *Stauranthera umbrosa*, *Boeica hirsuta*, *Aeschynanthus superbus* , during the said period along with Key to subfamilies and genera. Finalized the manuscript for submission which includes 82 species. Also prepared 6 photo plates and 9 line drawings. One field tour to Meghalaya and one herbarium consultations tour to ASSAM, Shillong was undertaken.

2. Project : Collection of Economic plant materials for enrichment & replacement of exhibits of the Botanical Gallery.

Executing Scientist : **Dr. A. K. Sahoo**

Date of initiation : April, 2010

Date to be completion : Ongoing

Background of the Project : For enrichment and replacement of exhibits of the Botanical Gallery ISIM, collection of Economic Plant materials from tribal localities of Jharkhand, Odisha has been done.

Summary of the work done during 2014-15 : One field tour conducted to tribal localities of Giridh district and adjacent district of Ranchi in Jharkhand state during September 2-10, 2014. Plant materials of 44 species were collected along with photographs, 48 species were documented for the enrichment of Botanical Gallery. Plant materials of 14 species were processed for incorporation as exhibits of the Botanical Gallery.

3. Project : Collection of oil crops, pulses and medicinal plant materials for enrichment of Botanical Gallery from Shillong, Meghalaya and Nasik region of Maharastra

Executing Scientist(s) : Shri Arumugam S
Shri Bishnu Charan Dey
Shri D.L.Shirodkar

Date of initiation : April, 2010

Date to be completion : Ongoing project

Background of the Project : This is an ongoing project for the collection of Economic Plant materials from tribal localities of N.E. India and Nasik region of Maharastra for enrichment and replacement of oil crops pulses and medicinal plant materials of the exhibits of Botanical Gallery.

Summary of the work done during 2014-15 : Shri Arumugam and Shri Bishnu have undertaken one field tour to tribal localities of Meghalaya in Second Quarter (June-July, 2014) and collected 16 different plants made artefacts (Bamboo, cane, wooden etc.), 8 Medicinal plants powder and their preparation and 55 plants photographs. Shri D.L. Shirodkar, undertaken one tour to Nasik and surrounding areas in third Quarter (Q3) during December 2014 and collected 30 Plants materials/artefacts were collected with photographs for the enrichment of Botanical Gallery.

4. Project : Listing & Identification of Dicot herbarium specimens at BSIS.

Executing Scientist : Mrs. Geeta Chaudhury

Date of initiation : 01 April 2013

Date to be completion : 31 March 2016

Background of the Project : Preparation of a digital database of Economic Herbarium, BSIS

Summary of the work done during 2014-15 : Listed of 2410 economic herbarium specimens with detailed data as available on herbarium labels at BSIS; also updated nomenclature of the same.

5. Project : Listing and identification of monocot herbarium specimens at BSIS

Executing Scientist : Shri Arumugam S

Date of initiation : 01 April 2013

Date to be completion : 31 March 2016

Background of the Project : The monocot herbarium specimens of BSIS contains many important collections including George Watt collections in all over the country in the project of Reporter of Economic Plants of India during the period of 1890-1940. All the collected plant materials are prepared as a herbarium specimens. Herbarium specimens

are maintained by the industrial Section, industrial Section herbarium.

Summary of the work done during 2014-15 : During the period April 2014 to March 2015 totally 2008 numbers of monocot herbarium specimens were listed in the Microsoft excel format. All the herbarium specimens were taken from herbarium carefully and listed each and every specimen detailed in the available notes on the herbarium specimens. All the names arranged by family and genus wise and updated the current name with the help of The Plant list, Tropicos, IPNI. The old specimens which are in fragile conditions are remounted and Genus cover, Species cover have been changed during the period.

6. Project : Listing of I.H. Burkill s herbarium collections at BSIS

Executing Scientist(s) : Dr. A. K. Sahoo
Shri Bishnu Charan Dey

Date of initiation : 01 April 2014

Date to be completion : 31 March 2015

Background of the Project : This work aims at documentation of Burkill's herbarium collections from different parts of India and surrounding countries like Burma, Bangladesh and Nepal, deposited at BSIS to provide a brief idea on Burkill's work in BSI during his tenure in India. These herbarium collections are now being preserved and digitized which will help future Botanists for further work on Economic Botany. The project manuscript has been prepared and submitted.

Summary of the work done during 2014-15 : Documented 1741 economic herbarium specimens of Burkill's herbarium collections with detailed data as available on herbarium labels at BSIS; also nomenclature updated of the same.

7. Project : Interpretation of the Family: Compositae in ICONES Roxburghianae

Executing Scientist(s) : **Dr. B. K. Sinha &**
Shri D. L. Shirodkar

Date of initiation : 01 April 2014

Date to be completion : 31 March 2015

Background of the Project : Scientific Interpretation of Botanical Drawings of the Family compositae of Icones made by Sir William Roxburgh.

Summary of the work done during 2014-15 : During 2014-2015 period, 52 Botanical paintings of William Roxburgh related to family Asteraceae were studied. Interpretations were made along with recent nomenclature changes.

Achievements/ Outcomes in 2014-15 : Manuscript finalised with detailed taxonomical information of 52 Botanical paintings of Family Asteraceae, made by William Roxburgh in his Icones.

8. Project : Interpretation of the Family: Euphorbiaceae in ICONES Roxburghianae

Executing Scientist : Dr. T. Chakraborty

Date of initiation : 01 April 2014

Date to be completion : 31 March 2015

Background of the Project : Scientific Interpretation of Botanical Drawings of the Family Euphorbiaceae of Icones made by Sir William Roxburgh.

Summary of the work done during 2014-15 : During 2014-2015 period, 73 Botanical paintings of William Roxburgh related to family Euphorbiaceae were studied. Interpretations were made along with recent nomenclature changes.

Achievements/ Outcomes in 2014-15 : Manuscript finalised with detailed taxonomical information of 73 Botanical paintings of Family Euphorbiaceae, made by William Roxburgh in his Icones.

9. Project : Identification & listing of the specimens of the family Poaceae at BSIS

Executing Scientist : Shri Arumugam S

Date of initiation : 01 April 2014

Date to be completion : 31 March 2016

Background of the Project : Poaceae herbarium specimens which was collected by various people (Including George Watt) in all over the country in the project of Reporter of Economic Plants of India during the period of 1890-1940. Herbarium specimens are maintained by the industrial Section, industrial Section herbarium. Identifying and Listing the Economic herbarium Poaceae specimens which are available in the Botanical survey of India, Industrial Section, Indian Museum.

Summary of the work done during 2014-15 : During the period April 2014 to March 2015, totally 1029 numbers of monocot herbarium specimens were listed in the Microsoft excel format and 48 specimens were identified with help of local and national floras, and Monograps, Revisinory works. All the herbarium specimens were taken from herbarium carefully and listed each and every specimen detailed in the available notes on the herbarium specimens. All the names arranged by family and genus wise and updated the current name with the help of The Plantlist, Tropicos, IPNI. The old specimens which are in fragile conditions are remounted and Genus cover, Species cover have been changed during the period. After completing of the computerising work the specimens arranged properly and kept again in the herbarium as usual format. ■ ■ ■

NORTHERN REGIONAL CENTRE, BSI, DEHRADUN

1. Project: Phytosociological Studies of Kalesar National Park, Haryana

Executing Scientist(s) : Dr. A.N. Shukla
Dr. S.K. Srivastava

Date of initiation : 01 April 2013

Date to be completion : 31 March 2015

Background of the Project : Floristic studies on Protected areas.

Area and locality of the Allotted Project : Kalesar National Park is covering an area of 46 sq km and lies at foot hills of Shiwalik ranges of Yamunanagar district, Haryana.

Summary of the work done during 2014-15 : One field tour w.e.f. 13th - 22nd November, 2014 was undertaken. A total of 100 field numbers of plant specimens were collected of which 94 taxa were identified, 79 taxa were documented along with update of nomenclatural citation, taxonomic description of five species was completed and 200 photographs were taken. Data on floristic diversity were collected on 20 sites (45 sq km) within the Kalesar National Park. The total of 15 compartments was examined by laying 140 quadrates. The quadrates of 10m × 10m randomly placed for sampling the trees, 3m × 3m for shrubs and climber species, 1m × 1m for herbs and grasses. The enumeration of the vegetation in each quadrate was carried out by measuring DBH [Diameter at Breast Height] individually in case of woody vegetation and collar diameter in case of herbs and grasses. Altitude, latitude and longitude of each sampled sites were recorded with the help of GPS. Soil samples [1 kg] for each quadrate were collected with the details of soil colour, texture, porosity and types. The final data quantitatively analysed for density, frequency and cover of the vegetation, were complied.

Achievements/ Outcomes in 2014-15 : Besides, identification of 94 taxa and documented 79 taxa, four rare and three economic plant species were recorded from the area, namely *Hymenodictyon orixense, Rauvolfia serpentina, Oroxylum indicum, Litsea glutinosa, Vitex negundo, Acacia catechu* and *Aegle marmelos.*

2. Project: Floristic Diversity and Phytosociological study of Flora of Col. Sher Jung (Simbalbara) National Park, Sirmaur, Himachal Pradesh

Executing Scientist(s) : Dr. M. R. Debta
Dr. S. K. Srivastava

Date of initiation : 01 April 2014

Date to be completion : 31 March 2017

Background of the Project : Floristic studies on protected areas.

Area and locality of the Allotted Project : The National Park covering an area of 27.8 sq. km lies in subtropical shiwalik region of the Sirmaur District of Himachal Pradesh.

Summary of the work done during 2014-15 : During this period, one field tour w.e.f. 13th-25th August, 2014 in the study area was conducted along with collection of 144 field numbers of plant specimens of which 65 species were identified and 41 species were documented. A total of 300 photographs were taken and identified. The total area covered during survey tour was about 20 sq. km. In addition to these, 55 quadrates (taking into account GBH for trees; Collar base for herbs and shrubs) were laid down to study the phytosociological aspects of its vegetation. Soil samples from each quadrate have been collected for quantitative analysis of edaphic factors influencing floristic components.

Achievements/ Outcomes in 2014-15 : The Park represents dry mixed deciduous forests dominated by *Shorea robusta, Terminalia elliptica, Buchnania lanzan, Grewia asiatica, Mallotus phillippensis, Ougeinia oojeinensis, Rhamnus triqueter*, etc. The riverine vegetation represented by *Agave angustifolia, Alternanthera sessilis, Ammania baccifera, Boerhavia diffusa, Chenopodium album, Desmodium pulchellum, Eriophorum comosum, Oxalis corniculata, Urena lobata, Saccharum spontaneum*, etc. The common weeds like *Parthenium hysterophorus* and *Lantana camara*.

A total of 65 species identified including two threatened species, namely *Rauvolfia serpentina* and *Habenaria plantaginea*, medicinal and edible plants like *Ammania baccifera, Biophytum reinwardii, Boswelia serrata, Curculigo orchioides,Eriophorum comosum, Lindernia crustacea, L. ciliata, Ficus racemosa, Grewia asiatica, Syzigium cumini, Ziziphus mauritiana*.

3. Project : Flora of Sonanadi Wild Life Sanctuary, Pauri District, Uttarakhand

Executing Scientist : Dr. R. Manikandan

Date of initiation : 2014

Date to be completion : 2017

Background of the Project : Floristic studies on protected areas.

Area and locality of the Allotted Project : The Sonanadi Wildlife Sanctuary, covering an area of 301 sq. km, lies at the riverside of Sonanadi and amidst the virgin forests in the Pauri district of Uttarakhand.

Summary of the work done during 2014-15 : During this period, one field tour *w.e.f.* 4.05.2015 to 20.05.2015 to the study area covering *c.*200 sq. km was conducted and 213 field numbers of plant specimens belongs to 180 species were collected along with 107 photographs of which 128 species were identified and described 53 species. Besides, 100 specimens were incorporated.

Achievements / Outcomes in 2014-15 : A total of 53 species were described along with updated nomenclature and ecological notes.The Sanctuary presents subtropical to tropical deciduous forests dominated by *Holoptelea integrifolia, Tectona grandis, Mallotus philippensis, Zizyphus* spp., *Millettia extensa, Phoebe lanceolata, Syzygium cumini, Shorea robusta, Terminalia* spp., etc. During the botanical exploration tour to the Sanctuary, collected the following RET live plants viz., *Dioscorea belophylla, Zingiber roseum, Hedychium thysiforme, Diplomeris hirsuta, Eria pubescens, Dendrobium* spp., *Flickingeria fugax, Luisia trichorhiza, Nervilia crispata, Vanda* spp., *Semecarpus anacardium, Phoenix acaulis,*

Lilium polyphyllum D. Don

Eulophia dabia, etc. to introduce in the NRC, Botanic garden.

Ethno-botanical information of *Terminalia bellirica, Cassia fistula, Syzygium cumini, Phyllanthus emblica,Bauhinia racemosa, Helicteres isora, Holoptelea integrifolia, Schleichera oleosa, Lannea coromandelica, Diospyros melanoxylon, Semecarpus anacardium, Wrightia tinctoria, Millettia extensa, Pueraria tuberosa, Cryptolepis buchananii, Porana paniculata, Ichnocarpus frutescens, Dioscorea belophylla, D. bulbifera*, etc. were gathered.

4. Project : Flora of Nandhour Wildlife Sanctuary, Uttarakhand

Executing Scientist : Dr. Kumar Ambrish

Date of initiation : 01 April 2014

Date to be completion : 31 March 2017

Background of the Project : Floristic studies on protected areas. The Nandhour Wildlife Sanctuary declared as the 7th newly declared Wildlife Sanctuary, Nainital district in the State of Uttarakhand in August, 2013.

Area and locality of the Allotted Project : The sanctuary comprises 269.95 sq. km areas of the Reserve forests of Haldwani and Champawat forest division in the State of Uttarakhand.

Summary of the work done during 2014-15 : During this period, one field tour conducted *w.e.f.* 30.10.2014 to 09.11.2014 to the area, collected 202 field numbers of *c.*580 plant specimens including 2 RET species of live plants along with 387 photographs were taken. Field data recorded of which 290 specimens were identified and 55 species were documented. During the study, 110 herbarium specimens were incorporated.

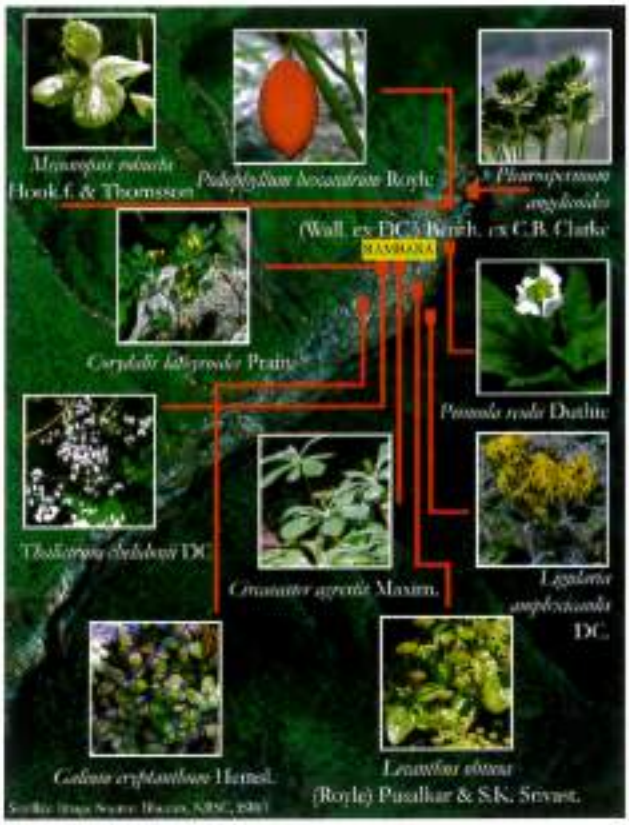
Achievements/ Outcomes in 2014-15 : The present study has recorded *Onosma limitaneum* as a new record for India and *Eriosema chinense, Indigofera exilis, Desmodium concinnum*var *retusum, Crotalaria medicaginea* var. *herniarioides, Senna alata* as new records for the state Uttarakhand. The Sanctuary is characterised by its unique geographical location between the Himalayas and Tarai, the Nandhour river streams, and crisscrossing ridges and remarkable variety of landscapes. Ethno-botanical information of *Callicarpa macrophylla, Vitex negundo, Pterocarpus marsupium, Clerodendrum indicum* and *Boehmeria rugulosa* were gathered. During the field trip, following RET plants namely *Acer caesium, Tinospora cordifolia, Barleria strigosa, Vanda cristata, V.tessellata, Celastrus paniculatus, Sauromatum venosum* and *Clerodendrum indicum* were collected of which *Vanda tessellata* and *Sauromatum venosum* were planted in the Experimental Garden of BSI, NRC, Dehradun.

5. Project : Kedarnath Natural Disaster - Impact on flora with special reference to Rare, Medicinal and Threatened species

Executing Scientist(s) : Dr. S. K. Srivastava
Dr. P. K. Pusalkar
Dr. Brijesh Kumar

Date of initiation : 01 April 2014

Date to be completion : 31 March 2015



Area and locality of the Allotted Project : Kedarnath, the northern abode or *Uttar Dham* of the lord Shiva, located in Rudra Prayag District of Uttarakhand in the Western Himalaya.

Background of the Project : Kedarnath or upper Mandakini valley struck with a natural disaster on 16-17 June 2013. Heavy rainfall followed by glacial lake (Chorabarital) burst resulted in a flash flood causing severe and tragic devastation of life, both human and flora alike. Alpine meadows of Kedarnath harbours high and diverse herbaceous diversity. In addition, the valley is a natural/ type habitat for many threatened and endemic species and their loss is the prime concern. In view of this, it is prime prerequisite to have detailed post disaster floristic inventory to assess floristic and population loss in general and that of rare, threatened and medicinal plants in particular.

Summary of the work done during 2014-15 : During this period, two field tours were conducted of which pre-monsoon one w.e.f. 13.06.2014-17.06.2014 and post monsoon one w.e.f. 13.09.2014-17.09.2014 in the disaster hit area. As no collection was permitted by Forest Department, 200 photographs of *c.* 700 species in sub-alpine and alpine areas were collected, identified and prepared a list along with impact on affected floristic elements, including floristic loss with special reference to Endemic, Rare and Endangered species

of the valley. Prepared a complete report of Kedarnath and submitted to BSI, HQ and for publication.

Achievements / Outcomes in 2014-15 : Impact assessment related to checking the existence and loss of flora was done based on field survey as well as identification of photograph. Noteworthy reports on new localities of four Endemic species *Galium cryptanthum*, *Impatiens badrinathii*, *I. devendrae* and *Impatiens leggei*; two rare species *Chrysosplenium trichospermum* and *Cypripedium elegans* and one Threatened species *Aconitum balfourii* were noted down.

6. Project : Revisionary studies of the genus *Lepisorus* (Sm.) Ching in India

Executing Scientist : Dr. Brijesh Kumar

Date of initiation : 01 April 2013

Date to be completion : 31 March 2016

Background of the Project : Revisionary studies.

Area and locality of the Allotted Project : India.

Summary of the work done during 2014-15 : During this year, two herbarium consultation tours were conducted to Sikkim Himalayan Regional Centre, Gangtok [BSHC] *w.e.f.* 18th-26th August, 2014 and to Arunachal Pradesh Regional Centre, Itanagar [ARUN], Eastern Regional Centre, Shillong [ASSAM] and Central National Herbarium, Howrah [CAL] *w.e.f.* 14th Mar.-10th Apr. 2014. Studied about 360 herbarium sheets of which, 290 specimens were reconfirmed and 70 specimens were identified. 10 Type images were procured from different herbaria.

Achievements / Outcomes in 2014-15 : Detailed description, updation of nomenclature with type details, distribution, taxonomic and ecological notes, uses with specimens examined were completed. A total of seven species *Lepisorus morrisonensis*, *L. thunbergianus*, *L. amaurolepidus*, *L. sublinearis*, *L. nudus*, *L. longifolius*, *L. loriformis* were dissected and described. Completed illustration of three species *Lepisorus clathratus*,*L. loriformis*,*L. thunbergianus*.Updated nomenclature of 17 species. Besides, information on types and distributional notes have been incorporated. *Botrychium simplex* a new record for Western Himalaya, from Uttarakhand and three new records for state of Meghalaya, *Athyrium schimperi*, *A. rupicola*, *A.pectinatum* were reported.

7. Project : Revision of Tree ferns (*Cyathea*,*Cibotium* and *Brainea*) of India

Executing Scientist : Dr. B. S. Kholia

Date of initiation : 2014

Date to be completion : 2017

Background of the Project : Regarding revisionary studies in India tree ferns are poorly understood or the knowledge on tree ferns is outdated. Tree ferns (*Cyathea* and allied genera) were described by various workers with different names. To solve complexity of this genus and resolve taxonomic ambiguities the detailed taxonomic studies of this genus is undertaken.

Area and locality of the allotted Project : India

Summary of the work done during 2014-15 : A complete checklist of Indian tree ferns with author citation, correct nomenclature and distribution is prepared. Request has been sent for protologue and types images to various herbaria and procured the required materials of *Cyathea nilgirensis*, *C. andersoni*. Described 4 species and consulted DD herbarium and examined 60 sheets of about 20 species of ferns.

Achievements/ Outcomes in 2014-15 : Described four species in detail viz., *Cyathea brunoniana*, *C. spinulosa*, *C. gigantean* and *C. chinensis* based on the herbarium specimens. Published a pictorial book entitled Ferns and Fern allies of Sikkim Part-II (2014) and following novelties were published in it: 4 new taxa of ferns: *Pichisermollods fraser-jenkinsonii* Kholia, *Thelypters (Stegnogramma) mollissima* var. *truncata* Kholia, *Tectaria coadunata* var. *elongata* Kholia, *Polystichum thomsonii* forma *himalaicum* Kholia. 4 New records for India from Sikkim: *Cheilanthes tibetica*, *Asplenium shimurae*, *Dryopteris fangii*, *Pteris wallichinana* var. *yunanaensis*. 10 new record for Sikkim: *Ophioglossum pendulum*, *Athyrium nakanoi*, *Asplenium crinicaule*, *A. magnificum*, *A. pellucidum*, *A. simonsianu*, *Tectaria simonsii*, *Dicranopteris spelndida*, *Trichomanes sublimbarum*, *Belvisia macronata* and *Botrychium simplex* is recorded from western Himalaya for the first time. Rediscovery of *Ophioglossum pendulum* from North India after 150 years.

8. Project : Revisionary study of family Bignoniaceae in India

Executing Scientist(s) : Shri V. K. Madhukar
Dr. S. K. Srivastava

Date of initiation : 2013

Date to be completion : 2016

Background of the Project : Revisionary studies.

Area and locality of the Allotted Project : India

Summary of the work done during 2014-15 : During this period, identified, dissected out with the help of Stereo zoom Microscope, illustrated, described and updated the nomenclature and distribution data for the following 14 species under 7 genera *Radermachera borii*, *R.bipinnata*,

R. glandulosa, R. pinnata. R.acuminata, R.sinica, R. xylocarpa, Tabebuia aurea,Adenocalymma comosum, Bignonia australis, B. capreolata,B. magnifica, Campsis grandiflora, Catalpa bignonioides,Clytostoma binatum.

Achievements/ Outcomes in 2014-15 : During this period, two herbarium consultation tours cum field tour to BSJO; MH; BSI and BLAT, and collected 10 field numbers, studied 15 species, identified 50 species and 25 specimens were incorporated.

During herbarium consultation tour he has also collected *Tecomella undulata* (Sm.) Seem, *Tecoma stans*(L.) Juss.ex Kunth., *Tabebuia rosea* (Bertol.) Bertero ex A. DC, *Spathodea campanulata* P. Beauv, *Roseodendron donnell-smithii* (Rose) Miranda, *Handroanthus impetiginosa* (Mart ex DC.)Mattos, *Tabebuia rosea* (Bertol.) Bertero ex A. DC, *Tecoma castanifolia, Millingtonia hortensis* L.f.from Rajasthan, TamilNadu and Maharashtra. Detailed description, updation of nomenclature with type details, distribution,taxonomic and ecological notes, uses with specimens examined were completed in respect of 14 species under 7 genera of the family Bignoniaceae. Further, he has also contributed the taxomonic treatment of the family Bignoniaceae for the Flora of Uttarakhand.

9. Project : Flora of Uttarakhand, Vol. 3 [Caprifoliaceae-Cuscutaceae]

Executing Scientist : Dr. Prashant K. Pusalkar

Solidago dahurica Kitag. ex Luz.

Incarvillea emodi Chatterjee

Date of initiation : 01 April 2011

Date to be completion : 31 March 2015

Background of the Project : Floristic compilation-State Flora Series.

Area and locality of the Allotted Project : Uttarakhand

Summary of the work done during 2014-15 : During this period conducted one ex-situ conservation tour and collected 200 field numbers including 5 RET species, 34 medicinal plants, orchids, ornamental species and 22 species of ferns were introduced in the garden, taken 100 photographs and identified 724 specimens, documented 250 species and incorporated 200 specimens. During this year, one 1 new species, 4 new records for India and 6 New record for Uttarakhand,1 Rediscovery after 50 years and presence of one previously excluded species confirmed in Indian Flora.

Achievements/ Outcomes in 2014-15 : A total of 250 species described and discovered one new species *Picrorhiza tungnathii* Pusalkar-Scrophulariaceae],New record to India (4): *Solidago dahurica, Carpesium cordatum,Galium boreale* var. *Ciliatum,Galium boreale* var. *intermedium.* New record for Phytogeographic zone- (3) : *Corydalis stracheyi* var. *ecristata; Drymaria villosa,Juncus allioides.*New record for Uttarakhand (6):*Juncus allioides, J. bufonius* var. *congestus;Corydalis stracheyi* var. *ecristata, Drymaria villosa, Carpesium cordatum,Galium boreale* var. *ciliatum.*Rediscovery after 50 years:(1) *Sibbaldianthe adpressa.* Confirmed in Indian Flora: (1): *Corydalis aduncа.*

10. Project : Flora of Uttarakhand- Vol. IV [Solanaceae-Ceratophyllaceae] Estt. spp. c. 934

Executing Scientist(s) : Dr. Kumar Ambrish
Dr. R. Manikandan

Dr. Manas Ranjan Debta
Dr. D. Dutta Pramanik
Dr. S.K Srivastava
Sri M.K. Singhadiya

Date of initiation : 01 April 2013

Date to be completion : 31 March 2015

Area and locality of the allotted project : Uttarakhand State, N. W. Himalaya

Background of the Project : State Flora.

Summary of the work done during 2014-15 : Dr Kumar Ambrish: Described 185 species belongs to the family Chenopodiaceae, Euphorbiaceae and Polygonaceae and examined 372 specimens.

- Dr. R. Manikandan has undertaken one Herbarium Consultation Tour w.e.f. 30.6.14 to 8.7.14 to LWG and studied 220 specimens of 77 species and described 158 species belongs to the families Lamiaceae, Lauraceae, Scrophulariaceae, Santalaceae, Elaeagnaceae.
- Drs. Debasmita Dutta Pramanick & S.K. Srivastava have described 72 taxa belonging to families Daphniphyllaceae, Moraceae, Piperaceae, Ulmaceae, Saururaceae, Buxaceae and Cannabaceae.
- Drs. Manas Ranjan Debta & S.K. Srivastava have described 44 taxa belonging to 20 genera from Amaranthaceae, Fagaceae, Thymelacaceae.
- Sri M.K. Singhadiya has described 54 taxa belonging to 23 genera from Balanophoraceae, Betulaceae, Casuarinaceae, Ceratophyllaceae, Aristolochiaceae, Juglandaceae, Loranthaceae, Myricaceae, Platanaceae, Proteaceae, Salicaceae.

Achievements / Outcomes in 2014-15 : Writing of the Flora of Uttarakhand vol. 4 comprises nomenclature citation, taxonomic description, phenology, habitat, and distribution within state and worldwide including India. Details of selected specimens studied at different herbaria were also given. Information on nomenclature notes if any and uses have been appended besides, key to the genera and species were also incorporated in respect of each species carried out by each scientist.

- Dr Kumar Ambrish completed total 185 species under 53 genera belonging to the family Chenopodiaceae, Euphorbiaceae and Polygonaceae.
- Dr. R. Manikandan studied and described 158 speciesunder 63 genera belonging to the family Lamiaceae, Santalaceae and Lauraceae.
- Drs. Debasmita Dutta & S.K. Srivastava completed systematic account of 72 species belonging to the 16 genera belonging to family Moraceae, Piperaceae, Ulmaceae, Saururaceae, Buxaceae, Cannabaceae and Daphniphyllaceae.

Catamixis baccharoides Thomson

- Drs. Manas Ranjan Debta & S.K. Srivastava have completed documentation and description of 44 species belonging to 20 genera from Amaranthaceae, Fagaceae, Thymelacaceae.
- Sri. M.K. Singhadiya completed systematic account of 54 species under 23 genera belonging to the family Balanophoraceae, Betulaceae, Casuarinaceae, Ceratophyllaceae, Juglandaceae, Loranthaceae, Myricaceae, Platanaceae, Aristolochiaceae, Proteaceae, Salicaceae.

11. Project : *Ex-situ* conservation of RET and Economic Plant species in the experimental garden of NRC

Executing Scientist : Dr. Prashant K. Pusalkar

Date of initiation : 01 April 2014

Date to be completion : 31 March 2015

Summary of the work done during 2014-2015 : During this period, two field tours to different regions were conducted *w.e.f.* 10.06.2014 to 13.06.2014 and 13.09.2014 to 17.09.2014 in temperate to sub-alpine regions of North Garhwal and Alkananda and Mandakini valleys, collected 22 RET species for introduction in the garden.

Achievements / Outcomes in 2014-15 : 22 threatened, endemic and medicinal species were introduced in the garden of which some are *Dioscorea deltoidea, Skimmia laureola, Paris polyphylla, Wigandia kunthii, Catamixis baccharoides, Rhododendron arboretum, Ailanthus excelsa, Habenaria intermedia, Malaxis acuminata, Origanum vulgare, Bergenia ciliata, Phytolacca acinosa, Hedychium spicatum, Begonia picta* Wall. *Strobilanthus atropurpureus, Rhododendron barbatum, Dendrobium* sp., *Bulbophyllum* sp., *Pteris wallichiana, Osminda claytoniana, Tectaria coadunata* etc.

12. Project : ***In vitro*** **propagation of rare, endangered and threatened species of North-West Himalaya**

Executing Scientist : Dr. Giriraj Singh Panwar

Date of initiation : 01 July 2012

Date to be completion : 31 March 2015

Background of the Project : *In vitro* propagation/Tissue Culture : The unique physiographic condition within the Western Himalayan region possesses luxuriant and varied vegetation, most of which is important from nutritional, aesthetic and medicinal significance. It is estimated that more than 50% species are under various threats due to their medicinal and aesthetic value from this region. The sudden rise in the demand of herbal products and unplanned extraction of plant resources across the world resulted in the depletion of RET species. In view of this, the present project has undertaken to develop and standardize the protocol for *in vitro* clonal propagation and mass multiplication of the threatened taxa along with germplasm conservation of endangered species.

Summary of the work done during 2014-15 : During this study, *in vitro* propagation protocol was standardized for the mass multiplication of *Pittosporum eriocarpum* and in vitro regenerated plantlets were successfully transferred to the field. Callusing was induced in leaf explant of *Indopiptadenia oudhensis*. The axillary shoot tip/nodal segment explants of *Catamixis baccharoides* were inoculated in multiple shoot induction medium supplemented. The scales of *Lilium polyphyllum* was inoculated in the shoot induction medium. Recorded the experimental observations and photography of the cultures.

Achievements/Outcomes in 2014-15 : *In vitro* propagation protocol has been standardized first time for science and in India for the *Pittosporum eriocarpum*, a RET species and plantlets have been successfully transferred to the open environment. Besides, some morerare, endangered and economically important plants were collected and *ex-situ* conservation through micropropagation has been initiated. Standardization of complete protocol for two endangered and endemic species of the N-W Himalaya viz. *Eremostachys superba* and *P. eriocarpum* and plantlets were successfully transferred to their natural habitat.

Seedlings of *Incarvillea emodi* Chatterjee growing in experimental garden of NRC, Dehradun

SIKKIM HIMALAYAN REGIONAL CENTRE, GANGTOK

1. Project : Flora of India: Family Rubiaceae

Executing Scientist : Dr. M. Gangopadhyay

Date of initiation : 01 April 2012

Date to be completion : 31 October 2015

Objectives : To revise the Family Rubiaceae (approx. 129 species) with up to date nomenclature, description and line drawings along with keys to genera and species as per Flora of India format and same to be submitted for publication.

Summary of work done : 129 species of the family Rubiaceae had been critically studied based on the flowers and fruits dissection on the collections deposited in CAL. The description of the species had been amplified and included in the revised and final manuscript of the family Rubiaceae for Flora of India. Sixty seven (67) illustrations of the family Rubiaceae had been drawn from the herbarium specimens deposited in CAL and the drawings of the dissected plants parts were included. Both the revised manuscript and the illustrations with the legend of the family Rubiaceae for Flora of India had been submitted for publication. Later, the list of the species (pages 1 – 43) and the list of the vernacular names (pages 1 – 11) of the family Rubiaceae had been prepared and submitted. Seven (07) Local Field Tours undertaken in 2014-15 and collected 113 field numbers; also taken 430 numbers of photographs Besides, the allied family Carlamanniaceae for Flora of India with 2 illustrations and legend had been also submitted for the Publication. The illustrations (1 – 100) with legend of the family Lauraceae for Flora of India had also been submitted for publication.

2. Project : Red listing of Orchids of Eastern Himalaya (Entire Sikkim, Darjeeling District of West Bengal andArunachal Pradesh excl. Changlang and Tirap) asper IUCN criteria.

Executing Scientist : Dr. D. K Agrawala

Date of initiation : 01 April 2013

Date to be completion : 31 October 2018

Summary of work done : During this period, three field tours and two Herbarium Consultation Tour to ARUN, APFH, ARRI, OHT, NERIST, Rajiv Gandhi University, Arunachal and CAL were undertaken. During these HCT, a total of 5718 specimens were examined, some of which are *Acampe rigida* (Buch.-Ham. Ex J.E. Sm.) P.F. Hunt [*DKA* 37851]; *Aerides odoratum* Lour. [*DKA* 37847]; *Aorchis spathulata* (Lindl.) Vermeul. [*G.P. Sinha & B.K. Shukla* 23813]; *Arundina graminifolia* (D. Don) Hochr. [DKA 37865, *S. K. Jana* 17920]; *Bulbophyllum careyanum* (Hook.) Spreng. [*DKA* 38653]; *Bulbophyllum elatum* (Hook.f.) J.J. Smith [D.C.S. Raju & S. Singh 7706]; *Clanthe brevicorna* Lindl. [DKA 38862]; *Cleisostoma linearilobatum* (Seidenf. & Smitin.) Garay [*DKA* 38839]; *Coelogyne cristata* Lindl. [*Anonymous* 29994]; *Coelogyne longipes* Lindl. [*N. Pradhan & S.S. Rathore* 25577]; *Coelogyne occultata* Hook.f. [*N. Pradhan* 25745]; *Cryptochilus lutea* Lindl. [*A. Chhetri* 28028, *DKA* 38812]; *Cymbidium whiteae* King & Pantl. [cult. Orch. House]; *Dendrobium chryseum*Rolfe [Cult. Orch. House]; *Dendrobium jenkinsii* Lindl. [cult. Orch. House]; *Dendrobium monticola* Hunt & Summerh. [*A. Maity*15894]; *Dendrobium moschatum* (Buch.-Ham.) Sw. [Cult. Orch. House]; *Eria vittata* Lindl. [*S.K. Rai* 30000]; *Flickingeria fugax* (Rchb.f.) Hawkes [*DKA* 37846]; *Gastrochilus acutifolius* (Lindl.) Kuntze [DKA 37875] etc. Illustrations of the following species were prepared during the year. *Cymbidium devonianum* Paxton; *Bulbophyllum trichocephalum* (Schltr.) Tang & Wang; *Dendrobium jenkinsii* Lindl.; *Dendrobium chrysanthum* Lindl.; *Dendrobium chryseum* Rolfe; *Dendrobium chrysotoxum* Lindl.; *Dendrobium falconeri* Hook.; *Dendrobium thyrsiflorum* Rchb.f.; *Eriairsute* Lindl.; *Eria ferruginea* Lindl.; *Flickingeria fugax* (Rchb.f.) Hawkes; *Liparis nervosa* (Thunb.) Lindl.; *Papilionanthe teres* (Roxb.) Schltr.; *Phalaenopsis mannii* Rchb. f. *Dendrobium moschatum* (Buch.-Ham.) Sw.; *Eria bipunctata* Lindl.; *Gastrochilus pseudo-distichus* (King & Pantl.) Schltr. *Dendrobium hookerianum* Lindl.; *Acampe rigida* (Buch.-Ham. Ex J.E. Sm.) P.F. Hunt; *Bulbophyllum trichocephalum* (Schltr.) Tang & Wang; *Bulbophyllum thomsonii* Hook. f.; *Epigenium fuscescens* (Griff.) Summerh.; *Liparis cordifolia* Hook. f.; *Monomeria barbata* Lindl; *Androcorys josephii* (Rchb.f.) Agrawala & Chowdhery; *Aorchis spathulata* (Lindl.) Vermeulen; *Arundina graminifolia* (D. Don) Hochr.; *Bulbophyllum gamblei* Hook.f.; *Diplomeris irsute* (Lindl.) Lindl.; *Epipactis helleborine* (L.) Crantz.;*Gastrochilus affinis* (King &Pantl.) Kuntze; *Goodyera repens* (L.) R.Br.;*Gymnadenia orchidis* Lindl.; *Herminium lanceum* (L.) Vuijk.; *Herminium macrophyllum* (D. Don) Dandy; *Herminium monorchis* (L.) R.Br.; *Malaxis cylindrostachya* (Lindl.) Kuntze; *Malaxis muscifera* (Lindl.) Kuntze; *Peristylus fallax* Lindl.; *Peristylus nematocaulon* (Hook.f.) J.J. Wood; *Platanthera clavigera* Lindl.; *Platanthera edgeworthii* (Hook.f. ex Collett) R.K. Gupta; *Platanthera stenantha* (Hook.f.) Soo; *Satyrium nepalense* D. Don; *Satyrium nepalense* var. *ciliatum* (Lindl.) Hook.f.; *Spathoglottis ixioides* (D. Don) Lindl.; *Spiranthes sinensis* (Pers.) Ames; *Tipularia josephii* Rchb. f. ex Lindl.; *Cymbidium whiteae* King &Pantl.; *Bulbophyllum careyanum* (Hook.) Spreng.;*Chiloschista parishii* Seidenf.

3. Project: ProjectFlora of Shingba Rhododendron Sanctuary with GIS Mapping of EET Plant species

Executing Scientist : Dr. Chandan Singh Purohit
Date of initiation : 01 April 2013
Date to be completion : 31 March 2015

Objective : Survey and documentation of Flora of Shingba Rhododendron Sanctuary with GIS Mapping of EET Plant species.

Background of the Project : Floristic studies lead to an up to-date knowledge of the plant resources of the area (foods and raw materials); the supplementary food plants and those providing fodder for animals, carrying medicinal value and data that throw some light on the phyto-geographical problems. Although in recent years much work on the floristic studies has been made in the state with interest and enthusiasm by Botanical Survey of India, Sikkim circle and various Universities, colleges and Institute in the Sikkim and nearby area but this Sanctuary is sadly neglected.

Area and locality of the Allotted Project : The Shingba Rhododendron Sanctuary lies between 27° 42' 06" to 27° 50' 35" N and 88° 44' 21" to 88° 42' 51" E longitude, spreads over an area of 43 sq. km and is located between the Lachung and Yumthang valley in the North Sikkim, Eastern Himalaya, India.

Summary of work done during 2014-15 : During this period, floristic survey of Sanctuary was completed along with processing and deposition of collected plants in BSHC. Analysis of locally used medicinal plants was done. Manuscript finalized and submitted in two volumes on 31st March, 2015. Concise description of 530 vascular plant species (66 families belonging to 183 genera & 431 species in Dicotyledongs; 13 families belonging to 51 genera & 99 species in Monocotyledons) were prepared. A total of 165

Rhododendron arboreum Sm.

distribution maps of EET and some other important plant species of this sanctuary were also prepared.Photo plates containing the floral characters of 65 species of EET were done by dissecting the plant materials.During the study various ecological parameters (Density, Frequency, Abundance, Relative Density, Relative Frequency, Relative Abundance and RIV) were calculated on the basis of quadrate method.

Achievements/Outcomes in 2014-2015 : Two field tours w.e.f. 23.04.2014-03.05.2014 and 10.09.2014-18.09.2014 were undertaken and collected 282 field numbers of plant specimens along with photographs of 200 plant specimens. All the plant specimens were identified and submitted with proper identity. Besides, 530 plant species were incorporated in the herbarium.

The present study reports two new species, one new to India, Four new records for state and two rediscovery. Some of the rare, endangered and economic important plants collected and introduced in Garden are *Rhododendron anthopogon, Digitalis purpurea, Pleione hookeriana, Didymocarpu scorallodiscus, Rhododendron arboreum.*

Platycentum wallichii Hook.

Esmeralda cathcartii (Lindl.) Rchb.f.

1. Project : Flora of Srivilliputhur Wildlife Sanctuary, Tamil Nadu

Executing Scientist(s) : **Dr. K.A.A. Kabeer & Shri G. Gnanasekaran**

Date of initiation : 01 April 2011

Date to be completion : 3 March 2015

Objective : Documentation of the flora of Srivilliputhur WLS, Tamil Nadu along with study of endemic and rare species

Area and locality of the allotted project : Srivilliputhur Wildlife Sanctuary, Tamil Nadu (*c.* 485 sq. km)

Back ground of the project (earlier work) : Srivilliputtur

Grizzled Giant Squirrel Wildlife Sanctuary lies mostly in Virudhunagar district and partly in Madurai district nesting in the high ranges of the Western Ghats and was established in the year 1988. It is bordered on the southwest limit is contiguous with Sivagiri Reserved Forest of Tirunelveli Forest Division. It occupies an area of 485.2 sq. km. The sanctuary lies between the longitudes 77°21' to 77°46' E and latitudes 9° 21' to 9° 48' N. The elevation ranges between 163 to 1940 m and it receives both southwest and northeast monsoons. The sanctuary has a wide range of habitats – a mix of tropical evergreen forests and semi-evergreen forests (69.32 sq. km.), dry deciduous forests and moist mixed deciduous forests (51.66 sq. km.), grassland (152.18 sq. km.) and cultivated (121.07 sq. km).

Summary of the work done during 2014-15 : During this period, three field tours w.e.f. 16.06.2014 -28.06.2014, 27.10.2014- 07.11.2014 and 18.02.2015-28.02.2015 were conducted. During these field tours, a total of 389 field numbers of plant specimens were collected and 756

Hill Ranges of Srivilliputhur Wildlife Sanctuary

photographs of plants and vegetation were taken. Out of total collected field numbers 239 field numbers were identified, nomenclature citation and description made for 350 species and label writing was completed for 200 field numbers of 400 specimens. Incorporation of herbarium specimens is in progress. Live specimens of orchids were collected and sent to NOEG, Yercaud germplasm centre for conservation purpose. An interim field tour report of Srivilliputhur Wildlife Sanctuary, Tamil Nadu was submitted to Wildlife Warden for their local usage. Finalization of manuscript is under progress.

Achievement/Outcomes in 2014-15 : Live orchids were collected and sent to NOEG for conservation.

Anisomeles indica (L.) Kuntze

Canavalia virosus (Roxb.) Wight & Arn.

Gmelina asiatica L.

2. Project : Flora of Malabar Wildlife Sanctuary, Kozhikode, Kerala

Executing Scientist(s) : Dr. J. H. Franklin Benjamin
Mr. R. G. Vadhayar

Date of initiation : 01 April 2012

Date to be completion : 31 March 2015

Objective : To document the floristic diversity of Malabar Wildlife Sanctuary, Kozhikode, Kerala.

Area and locality of the allotted project : Malabar Wildlife Sanctuary, Kozhikode, Kerala , *c.* 74.22 sq. km.

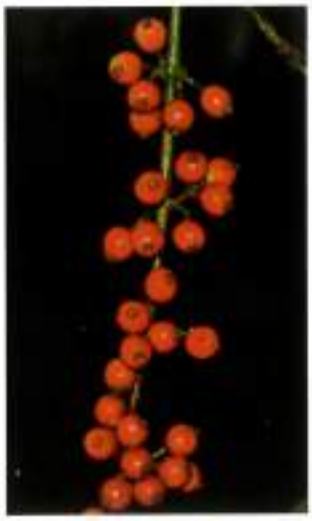
Back ground of the project : The Malabar WLS (MWLS) was constituted in 2009. The extent of the sanctuary is 74.215015 km^2 and falls between 11°75' and 11°76 N latitudes and between 75°20' and 75°38 E longitudes. The sanctuary is a microcosm of the richness of the biodiversity in the Western Ghats with a high degree of endemism characterized by the presence of high number of endemic taxa. This sanctuary is watershed region of Kozhikode district. An inventorisation of the angiosperm flora was undertaken from 2012.

Summary of the work done during 2014-15 : During this period, two field tours, viz., 14th - 24th July 2014 and 19th - 30th January, 2015 were undertaken in Rendamchizhi, Karinganni, Pannikottur, Payanikotta, Muthathupuzha, Payanipuzha, Ghat Road of Kakkyam, Dam site of Kakkayam, Surge, Kakkayam of Kerala and second one was conducted in Muthatthupuzha, Kombakkodemala, Seethapara, Payanikotta, Panamkumkadave, Randamchizhi, 10th Block, Ghat Road, Kakkayam Dam, Sankaranpuzha, Kappipadiand Ambalapara. 350 field numbers of plant specimens were collected along with 350 photographs. During this year 249 specimens have been identified.

Achievement/Outcomes in 2014-15 : Two field tours were undertaken and a total of 350 field numbers were collected in triplicate. Herbarium specimens of the same were also made. 249 specimens have been identified. During the present study year, *Baccaurea courtallensis* (Wight) Muell.-Arg. (Euphorbiaceae), *Cleisostoma tenuifolium* (L.) Garay, an epiphytic orchid and two Western ghats endemics, *Impatiens diversifolia* Wall. ex Wight &Arn. and *I. scapiflora* Heyne ex Roxb., were collected for the first time.

Muthatupuzha River, MWLS

Baccaurea courtallensis (Wight) Muell.-Arg.



Memecylon randerianum SM & MR Almeida

Vateria indica C.F. Gaertn., a Western Ghat endemic, was collected in fruits. *Argostemma courtallense* Arn., a plant endemic to India and an interesting parasitic epiphyte, *Tolypanthus lagenifer* (Wight) Tieghem, a western ghats endemic were collected.

3. Project : Karaivetti Wild life Sanctuary, Perambalur District; Vaduvur Wild life Sanctuary, Tiruvarur District; Udayamarthandapuram Wildlife Sanctuary, Tiruvarur District; Point Calimere Wild life Sanctuary, Nagapattinam District

Executing Scientist(s) : Dr. G.V.S. Murthy,
Dr. S. Kaliamoorthy
Shri Yarrayya Kondru

Date of initiation : 01 April 2013

Date to be completion : 31 March 2015

Objective : To document the flora of three Wild life Sanctuary of Tamil Nadu, *viz.*, Karaivetti, Vaduvur, Udayamarthandapuram and Point Calimere.

Area and locality of the allotted project : Karaivetti Wildlife Sanctuary, Perambalur District, *c.* 4.54 sq.km. Vaduvoor Wildlife Sanctury, Tiruvarur District, *c.*1.28 sq.km.; Udayamarthandapuram Wildlife Sanctuary, Tiruvarur District, *c.* 0.5sq.km; Point Calimere Wildlife Sanctuary, Nagapattinam District, *c.* 17.26sq.km.

Back ground of the project : The Karaivetti Bird Sanctuary (10°58'01"N, 79°11'07"E) declared in 1999 is located in Perambalur District of Tamil Nadu. . It is the biggest waterbody in the district and attracts thousands of birds every year.

The Vaduvoor bird sanctuary (10° 42' N, 79° 20' E) declared in 1999 is located in Vaduvoor, Ahragaram village of Mannargudi Taluk, of Thiruvarur District with an area of 128. 10 ha. The sanctuary is favourite fly- away spot for migratory birds and has recorded congregation up to 20, 000 birds in November.

Udayamarthandapuram bird sanctuary (10°58'49" N, 79°03' 26" E) declared in 1998 is located in Udayamarthandapuram village of Thiruvarur district of Tamil Nadu. The total area of the sanctuary is 45 ha. The sanctuary is basically an irrigation tank that is fed by water from Mettur dam and by the northeast monsoon. The sanctuary is home to a variety of migratory water birds like Coot, Grey Heron, White Ibis, Openbill Storks, Night Heron and Purple Heron.

Point Calimere Wildlife & Bird Sanctuary, a Ramsar Site, is located along the Palk Strait in three districts of Tamil Nadu, Nagapattinam, Tiruvarur and Thanjavur. It lies between 79°399' E - 79°884' E and 10°276 N - 10°826' N, covering an area of 38,500 hectares. The sanctuary habitat is a mix of grasslands, mudflats, backwaters, sand dunes, and Tropical Dry Evergreen Forest. The Tropical Dry Evergreen Forest of the sanctuary is considered as the richest tract in the country. The grasslands located on the southern part of the sanctuary are the natural habitat of the Blackbuck.

Summary of the work done during 2014-15 : During the period,4 field tours w.e.f. 15/07/2014 – 18/07/2014, 15/11/2014 – 21/11/2014, 22/06/2014– 25/06/2014 and 19/02/2015 – 25/02/2015 were undertaken in which a total of 287 field nos. of plant specimens were collected along with 400 photographs. All the collected specimens were identified, labelled and prepared a checklist of Karaivetti, Vaduvoor, Udayamarthandapuram WLS along with a list of the endemics of the sanctuary. Floristic diversity of the respective sanctuaries and measures for conservation of the flora, fauna and wetlands of the sanctuaries were documented.

Achievement/Outcome in 2014-15 : *Vanda tessellata* (Roxb.) Hook. ex G.Don, the only orchid found in the PC sanctuary. *Aegiceras corniculatum* (L.) Blanco, *Avicennia marina* (Forssk.) Vierh., *Excoecaria agallocha* L., *Rhizophora mucronata* Lam., are some of the mangroves found in PC sanctuary and the halophytes include *Suaeda maritima* (L.) Dumort., *Sesuvium portulacastrum* (L.) L., *Salicornia brachiata* Miq.

4. Project : Seaweed Survey of Karnataka Coast

Executing Scientist(s) : Dr. M. Palanisamy
S. K. Yadav

Date of initiation : 01 April 2014

Date to be completion : 31 March 2017

Objective : To Survey and documentation of the seaweed along the Karnataka coastal area.

Area and locality of the allotted project : Karnataka has a coast line of about 320 km. The coastline starts from Mangalore (Kerala – Karnataka border) in the south and end at Korwar in the north (Karnataka - Goa border).

Back ground of the project : Karnataka, one of the southern states of India is well known for its beautiful forests and rich biodiversity. It is located between 11° 31' – 18° 45' N latitude and 74° 12' – 78° 40' E longitude. The state of Karnataka has a coastline of about 320 km located between 12° 45' – 15° 00' N latitude and 74° 00' – 75° 00' E longitude. The coastline starts from Mangalore (Kerala – Karnataka border) in the south and end at Korwar in the north (Karnataka - Goa border). The entire coastline is almost narrow, broken at numerous points by rivers, rivulets, creeks, lagoons, cliffs, sand dunes and beaches. The northern coast is rocky while the southern coast is mostly sandy with several linear beaches. The mangroves are sparsely distributed along the coast in the estuaries areas. There are about 26 estuaries with more than 70000 ha water spread area and 80000 ha of brackish water area, making the 3 coastal districts of Karnataka very rich in marine biodiversity. There is one major port *i.e.* New Mangalore port and 10 minor ports located at Karwar, Old Mangalore, Belekeni, Tadri, Honnavar, Bhatkal, Kundapur, Hangarakatta, Malpe and Pudubidri.

Panaromic view of Surathkal coast, Karnataka during low tide

An exposed Rock supporting mixed seaweed vegitation

Though considerable work has been done on the seaweeds of several maritime states of the Indian coast, the seaweed resources of the Karnataka state have not been explored fully. The lacuna in the complete survey, documentation and seaweed flora of Karnataka coast is presently explored in this project.

Summary of the work done during 2014-15 : During 2014-15, one field tour to Karnataka coast w.e.f. 08th – 20th October, 2014 was conducted and collected a total of 226 field numbers of seaweed specimens in duplicate from 81 localities of which 213 field nos. were identified and made a total of 552

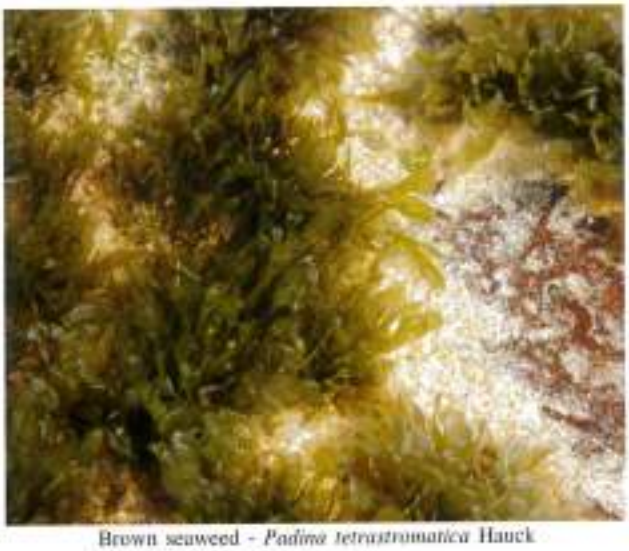
Red Seaweed - *Grateloupia lithophila* Borgesen

Red Seaweed - *Catenella repens* (Lightfoot) Batters

Red Seaweed - *Catenella impudica* (Montagne) J.Agardh

Red seaweed *Gracilaria corticata* (J. Agardh) J. Agardh

Green seaweed - *Enteromorpha flexuosa* (Wulfen) J. Agardh



Brown seaweed - *Padina tetrastromatica* Hauck

herbarium sheets with standard procedure. In addition to this, 52 field numbers of seaweed specimens were preserved in 4 % formalin and seawater mixture for detail study. GPS of the collection localities, nature of the coast, habit and habitats of seaweeds were recorded. During field trip, 200 photographs were taken. All the specimens were examined under microscopes in laboratory and identified with standard references. During this year, 57 species were documented and label writing is in progress. Endemic and economically important seaweeds were segregated.

Achievement/Outcome in 2014-15 : 213 f. nos were identified and 552 herbarium sheets were made.

5. Project : Ex-situ conservation of endemic endangered and threatened plants of the region and recording of phenology of flowering / fruiting of species in garden.

Executing Scientist(s) : Dr. S. Kaliamoorthy
B. S. Elango
T. S. Saravanan

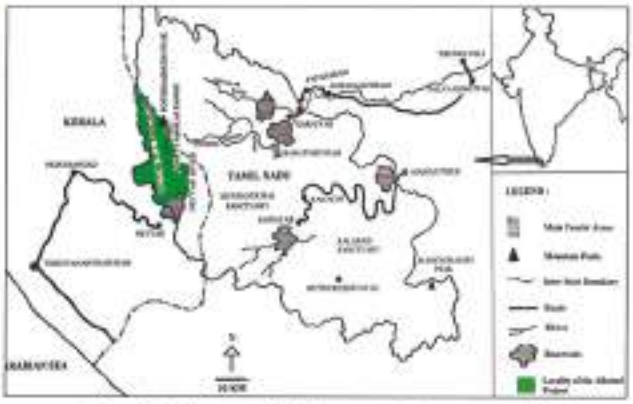
Date of initiation : 01 April 2014

Date to be completion : 31 March 2017

Objective : To study ex-situ conservation of endemic, endangered and threatened plants along with phenological data.

Area and locality of the allotted project : The present study was proposed to visit Agasthyamala Biosphere Reserve falling within the jurisdiction of Kerala state.

Back ground of the project : Agasthyamala, a towering range with a peak of 1868 m height is situated at the southern end of the Western Ghats. The area lying between 77°5' and 77°40 E longitude and 8°50' N latitude, falls within the hilly



tracts of the Kollam and Thiruvananthapuram districts of Kerala, and Tirunelveli-Kattabomman and Kanniyakumari districts of Tamil Nadu. It has a forest cover of about 2000 sq.km, with altitudes ranging from 67 to 1868 m. The area represents diverse ecosystems with almost all types of vegetation known to occur such as the southern tropical thorn forests, southern tropical moist deciduous forests, tropical semi-evergreen forests, southern tropical wet evergreen (rain) forests, subtropical montane forests and grassy swards at high altitudes. The Agasthymala Biosphere Reserve harbours approximately 2000 species of flowering plants which include 100 endemic and 50 rare and endangered species. In view of this, the present study proposal was proposed to the study area Agasthymala Biosphere Range, to collect and introduce rare, endemic, endangered and threatened orchid species in the National Orchidarium & Experimental Garden, BSI, SRC, Yercaud. This would in turn improve the number of germplasm collections of South Indian orchid species

Habenaria crinifera Lindl.

Dendrobium wightii A.D. Hawkes & A. H. Heller

Summary of the work done during 2014-15 : In 2014-15, total 4 field tour of which one on 17.09.2014 to Manjakuttai (Yercaud), second one w.e.f. 27.10.2014 to 02.11.2014 to Agasthyamala Biosphere Reserve forest, third one to Sanyasimalai Reserve Forest, Yercaud and fourth one w.e.f. 09.02.2015 to 14.02.2015 to Agasthyamala Biosphere Reserve forest, Keralawere were conducted. About 49 plant species were collected and introduced in NOEG, Yercaud. Some of which are *Habenaria longicorniculata* J. Graham, *H. grandiflori formis* Blatt. & Mc Cann, *H. longicornu* Lindl., *H. heyneana* Lindl., *H. rariflora* A. Rich, *H. roxburghii* Nicolson, *Musa ornata* Roxb., *Rhipsalis bassifera* (J.S. Muell.) Steam, *Annona muricata* L., *Anoectochilus elatus* Lindl., *Anisochilus argenteus* Gamble, *Taeniophyllum alwisii* Lindl. etc. About 195 plant species including endemic, RET plants and ornamental orchids were introduced for multiplication purpose.

Achievement/Outcome in 2014-15 : Two field tours to Agasthyamala Biosphere Reserve were undertaken apart from two local tours. About 49 plant species were collected and introduced from the above tour programmes. Flowering phenology was studied for 192 (Orchids 87 species; other angiosperms 105 species). Fruiting phenology was recorded for 31 species (Orchids 22; other angiosperms 09)

6. Project: Pollen and Seed morphology of Genus *Andrographis* Wall. ex Nees using SEM

Executing Scientist : G Gnanasekaran

Date of initiation : 01 April 2012

Date to be completion : 31 March 2017

Objective : To study the pollen and seed morphology of the genus *Andrographis* Wall. ex Nees, a tropical Asian genus of Acanthaceae.

Back ground of the project : The genus *Andrographis* Wall. ex Nees is taxonomically complicated. The present micro-morphological SEM studies on the seeds and pollen grains of species of *Andrographis* was undertaken to resolve problems in the systematics of the genus.

Pollen of *Andrographis glandulosa* (B.Heyne ex Roth) Nees

Seeds of *Andrographis stellulata* C.B. Clarke

Leaf lamina of *Andrographis neesiana* Wight

Summary of the work done during 2014-15 : During this period, pollen grains of 5 species *viz*., *A. beddomei* C.B. Clarke, *A. elongata* Vahl, *A. glandulosa* (B. Heyne ex Roth) Nees, *A. longipedunculata* Sreem., *A. ovata* (T. Anderson ex Bedd.) Benth. & Hook.f.; seed morphology of 5 species *viz*., *A. longipedunculata* Sreem., *A. viscosula* Nees, *A. stellulata* C.B. Clarke, *A. clarkeana* sp. nov., *A. rothii* C.B. Clarke and leaf surface of 18 species *viz*., *A. paniculata* (Burm.f.) Wall. ex Nees, *A. rotundifolia* (Sreem.) Sreem., *A. alata* (Vahl) Nees, *A. elongata* T. Anderson, *A. echioides* (L.) Nees, *A. serphyllifolia* (Rottler ex Vahl) Wight, *A. glandulosa* (B. Heyne ex Roth) Nees, *A. stenophylla* C.B. Clarke, *A. neesiana* Wight, *A. stellulata* C. B. Clarke, *A. atropurpurea* (Dennst.) Alston, *A. explicata* (C.B. Clarke) Gamble, *A. lawsonii* Gamble, *A. lineata* Wall. ex Nees, *A. lobelioides* (Wall. ex Nees) Wight, *A. macrobotrys* Nees, *A. producta* (C.B. Clarke) Gamble, *A. rothii* C. B. Clarke have been examined using light microscope and SEM. During this study, 15 species were acetolysed and studied under Light Microscope (LM).

Achievement/Outcome in 2014-15 : During this year, pollen grains of 5 species , seed morphology of 5 species, leaf surface of 18 species, have been examined using light microscope and SEM. During this study, 15 species were acetolysed and studied under Light Microscope (LM).

7. Project : Seed morphology of *Ficus* L. using SEM

Executing Scientist : Dr. J. V. Sudhakar

Date of initiation : 01 April 2012

Date to be completion : 31 March 2017

Objective : To study the seed morphology of Genus *Ficus* L. by using the SEM.

Area and locality of the allotted project : India

Back ground of the project : The genus *Ficus* is very complex with 6 subgenera (*Urostigma, Pharmacosycea, Sycomorus, Sycidium, Synoecia and Ficus*) and several sections, subsections, series and subseries. During the review of literature, it was observed that there are no SEM studies on the seed (Achene) morphology for any of the Indian taxa and

Ficus squamosa pro Roxb.

Ficus amplocarpa Govind. &

Ficus travancorica King

Ficus exasperata Vahl

also at the global level. Hence, it is undertaken here to study the micro morphological characters of achene with SEM in addition to other morphological characters to delimit the taxa.

Summary of the work done during 2014-15 : During this period, 30 fresh samples (seeds) of *Ficus* sp., collected from

Nilgiris, Anamalais & Pulney hills and 5 samples of Northeast species from herbarium sheets were studied under SEM. 50 SEM Images were taken for 20 taxa *viz.*, *Ficus amplocarpa* Govind. & Masil.; *Ficus anamalayana* sp. nov.; *Ficus beddomei* King *Ficus carica* L.; *Ficus caulocarpa* (Miq.) Miq.; *Ficus concinna* (Miq.) Miq.; *Ficus cupulata* Haines; *Ficus curtipes* Corner; *Ficus drupacea* Thunb.; *Ficus exasperata* Vahl; *Ficus fergusonii* (King) T.B. Worth. ex Corner; *Ficus geniculata* Kurz; *Ficus glaberrima* Blume; *Ficus macrophylla* Desf. ex Pers.; *Ficus microcarpa* L. f.; *Ficus middletonii* Chantaras.; *Ficus semicordata* Buch.-Ham. ex Sm.; *Ficus squamosa* Roxb.; *Ficus superba* (Miq.) Miq.; *Ficus travancorica* King; *Ficus trimenii* King ex Trimen.

Achievement/Outcome in 2014-15 : 20 taxa were studied and SEM images were taken.

8. Project : Study of Caryopsis in *Eragrostis*, *Sporobolus* and *Tripogon* genera of Poaceae using SEM

Executing Scientist : Dr. K. A. A. Kabeer

Date of initiation : 01April 2012

Date to be completion : 31 March 2017

Objective : To study the Caryopsis of the grass Genus *Eragrostis, Sporobolus* and *Tripogon* by using SEM.

Back ground of the project : Identification and delimitation of species of the Poaceae are quite difficult. Morphology of inflorescence, spikelets and its components are main aid of identification. But further morphological details needs to fix the identity of some closely related species. The caryopses and the morphological features it contains are most useful and are reliable and constant within taxa. Therefore, the SEM studies of the 3 genera of Poaceae were selected.

Summary of the work done during 2014-15 : The caryopsis morphology of 11 species of *Sporobolus* were studied under SEM. Five species of *Eragrostis* have been collected. Collection of caryopsis of *Tripogon* specimens is in progress.

Achievement/Outcome in 2014-15 : All 32 species of *Eragrostis* have been completed with the 5 species studied during the current year. Collection and SEM Studies of *Sporobolus* and *Tripogonis* are in progress.

9. Project : Study of Pollinia of South Indian Orchids using SEM

Executing Scientist : Dr. G. V. S. Murthy

Date of initiation : 01.04.2012

Date to be completion : 31.03.2017

Objective : To study the variety of pollinia of orchid species found in Southern India by using SEM.

Coelogyne flaccida Lindl.

Dendrobium herbaceum Lindl.

Area and locality of the allotted project : South India

Back ground of the project : Orchidaceae is the second largest families of the flowering plants of the world. Orchidaceae includes about 788 genera and 24,500 species. In India the family is represented in India by 1331 taxa (Misra 2007) out of which about 240 taxa are found in south India. Orchids are unique assemblage of highly advanced monocotyledons. These are characterized by distinct floral morphology, pollination mechanism, association with unique fungal partners (Mycorrhizae) and miniscule seeds. Most orchids characteristically package pollen into discrete units that are removed as a single unit from the flower during the pollination process. In functional terms, this means that the whole pollen content of a flower is removed during a single pollinator visit. These pollen packages are called pollinia. The Features such as number, texture (friable vs.entire) and shape of pollinarium parts are quite consistent and often diagnostic among orchid taxonomic groups.Therefore, a SEM study on the Pollinia of Orchids of Southern India has been taken.

Summary of the work done during 2014-15 : During this year, a list of Orchids for study of Pollinia was prepared. Study of the pollinia of *Dendrobium*, *Coelogyne* & *Eria* is under progress.

1. **Project : Studies on the Orchids of Maharashtra with ecological aspects, population status of endemics and GIS mapping**

Executing Scientist : Dr. Jeewan Singh Jalal

Date of initiation : 01 April 2012

Date to be completion : 31 March 2015

Objective : To document the Orchid diversity of Maharashtra with ecological aspects, population status of endemic orchids and IUCN threat assessment for conservation measures.

Area and locality of the Allotted Project : 3,07,731sqkm, Maharashtra state. The state Maharashtra lies between the latitudes 22°1' to 16°4' N and longitudes 72°6' to 80°9' E. The state covers an area of 3,07,731sq km, which accounts for about 9.84 percent of the total area of the country. It is bordered by the Arabian Sea to the west, Gujarat and the Union territory of Dadra and Nagar Haveli to the northwest, Madhya Pradesh to the north and northeast, Chhattisgarh to the east, Karnataka to the south, Telangana to the southeast and Goa to the southwest. That state has a tropical monsoon climate. The average annual rainfall in the Western Ghats is 2,000 mm but in some areas it reaches up to 3,500 mm. The altitude varies from mean sea level to 1650 meters. It comprises 35 districts and shows marked differences in topographic features and can be divided into (i) Konkan, (ii) Sahyadries (Western Ghats) and (iii) Plateau. The 'Konkan' is a narrow strip of the coastal land lying between Arabian Sea and Western Ghats. The area of Western Ghats of Maharashtra known as 'Sahyadris' which runs in north-south direction with a total length of 750 km and average width of 80 km. Over 90 % region of the state is occupied by the plateau. The extensive table-land called as Deccan or Maharashtra plateau is situated in the eastern region of Western Ghats.

Background of the Project : Orchids of Maharashtra are under stress by different factors. Rapid urbanization and forest fragmentation has resulted in the disappearance of many taxa of orchids from wild. This situation has created into the extinction of many species. Taxa which are reported by earlier workers are now either rare or disappeared from its locality. The present work was undertaken to explore the orchid diversity and provide up to-date nomenclature and mapping of all the documented orchids of Maharashtra along with assessment of all orchids at regional level based on IUCN Red list criteria and identification of the major threats with conservation measures taken.

Summary of the work done during 2014-15 : During this year, three field tours covering an area of 750 sq km in Ambey valley, Mulsi area, Valane in Mulsi, Saltar dam area, Khadakwasla dam catchments, Sinhagadghat area, Lohagad area, Pavana dam catchments, Tamhini Ghat, Khandalaghat, Rajmachi area, Lavasa valley, Bhatghar area, Bhor area, Nandurbar district, Nashik district and Kolhapur district were undertaken. During these tours, 213 field number of plant specimens were collected and 350 photographs were taken. A total of 465 herbarium data were entered in spreadsheets and validate their localities for geo-referencing. Descriptions of 51 species were completed. Besides coloured illustrations of 58 species, red listing of 101 species based on the IUCN guidelines 2001 (version 3.1) and IUCN Red List Categories and Criteria (IUCN 2012) were also done. The final report of "**Studies on the Orchids of Maharashtra with ecological aspects, population status of endemics and GIS mapping**" were compiled and submitted. During this year, one herbarium consultation tour to Blatter Herbarium, St. Xavier's College, Mumbai was executed with examination of 375 herbarium specimens belonging to 93 orchid species.

Achievements/ Outcomes in 2014-15 : A total 52 plant species *viz., Acampe praemorsa, Aerides crispa, Aerides maculosa, Bulbophyllum fimbriatum, Cheirostylis parvifolia, Conchidium exile, Conchidium filiforme, Conchidium microchilos, Cottonia peduncularis, Dendrobium aqueum, Dendrobium barbatulum, Dendrobium lawianum, Dendrobium macrostachyum, Dendrobium microbulbon, Dendrobium nanum, Dendrobium nodosum, Eulophia ochreata, Eulophia spectabilis, Geodorum densiflorum, Habenaria crinifera, Habenaria digitata, Habenaria diphylla, Habenaria foliosa, Habenaria frucifera, Habenaria gibsonii, Habenaria grandifloriformis, Habenari aheyneana, Habenari alongicorniculata, Habenaria multicordata, Habenaria ovalifolia, Habenaria rariflora, Habenaria suaveolens, Liparis nervosa, Malaxis versicolor, Nervilia concolor, Nervilia crociformis, Nervilia nfundibulifolia,*

Habenaria suareolens Dalzell - an endemic orchid in plateaus of Maharashtra

Dendrobium barbatulum Lindl. - an endemic orchid of Maharashtra

*Nervilia plicata, Oberonia recurva, Pecteilis gigantea, Peristylus aristatus, Peristylus densus, Peristylus plantagineus, Peristylus stocksii, Porpax jerdoniana, Rhynchostylis retusa, Smithsonia viridiflora, Vanda tessellata, Vanda testacea*and *Zeuxine longilabris* were documented.

This study also reported ethno-botanical information on *Vanda tessellata* by *Kurku* tribe in Maharashtra. During this period 21 orchid species were introduced in the office garden for ex-situ conservation.

2. Project : Floristic diversity of Sharavathy Valley Wildlife Sanctuary, Karnataka

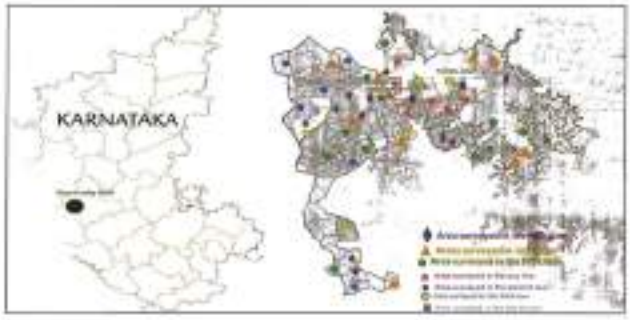
Executing Scientist : Dr. S.K. Das Das

Date of initiation : 01 April 2012

Date to be completion : 31 November 2015

Objective : To document the Floristic diversity of SharavathyValley Wildlife Sanctuary, Karnataka

Area and locality of the Allotted Project : 431 sqkm, in Shimoga district, Karnataka



Background of the Project : The Sharavathi Valley Wildlife Sanctuary(latitude 13 542 103 to 14 162 313 North and longitude 74p 382 323 to 74p 592 453 East), declared as a wildlife sanctuary on 20th April, 1972, covering an area of 431 sq km and has an altitudinal range between 300m and 1102m, temperature range from 15 to 38 C and mean annual rainfall 4500 mm, is situated in the Shimoga District of Karnataka of Western Ghats. It includes a large part of the Linganamakki reservoir formed by the damming of the Sharavathi River by the Karnataka Power Corporation. The sanctuary is having 40 small villages usually 1 to 10 houses in each with approximate population of 3500. Apart from the area occupied by the Linganamakki Reservoir (123.63 sq km), the Sharavathi Wildlife Sanctuary is divided into core zone (74.33 sq. km), buffer zone (170.67 sq km) and tourism zone (57.53 sq km). The sanctuary shares its south western boundary with the Mookambika Wildlife Sanctuary, Kargal in the northern boundary and Nagavalli in coastal boundary. Sharavathi Wildlife Sanctuary, comprising of dense evergreen, semi-evergreen and some moist deciduous forests, houses Tiger, Leopard (Black Panther), Wild Dog, Jackal, Sloth Bear, Spotted Deer, Sambar, Barking Deer, Mouse Deer, Wild Pig, Common Langur, Bonnet Macaque, Malabar Giant Squirrel, Giant Flying Squirrel, Porcupine, Otter and Pangolin. The project was undertaken as no floristic survey account is available for this area till date.

Sharavathy Wildlife Sanctuary, Karnataka - a view of evergreen forests

Ardisia solanacea (Poir) Roxb. in Sharavathy WLS, Karnataka

Summary of the work done during 2014-15 : During this year, one field tour covering an area of about 40 sq km was undertaken w.e.f. 09.10.2014 – 22.10.2014. During this tour, about 171 field nos. of plant specimens were collected, poisoned and about 475 specimens were mounted of which 147 field nos. were identified, 200 photographs were taken of which 30 photographs were identified.

Achievements outcomes in 2014-15 : This study also reported rediscovery of *Crotalaria lutescens* (Fabaceae), an endemic species of Western Ghats.

3. Project : Floristic diversity of Biligiri Rangaswamy Temple (BRT) Wildlife Sanctuary, Karnataka

Executing Scientist : Dr. J. Jayanthi
Date of initiation : 01 April 2013
Date to be completion : 31 March 2017

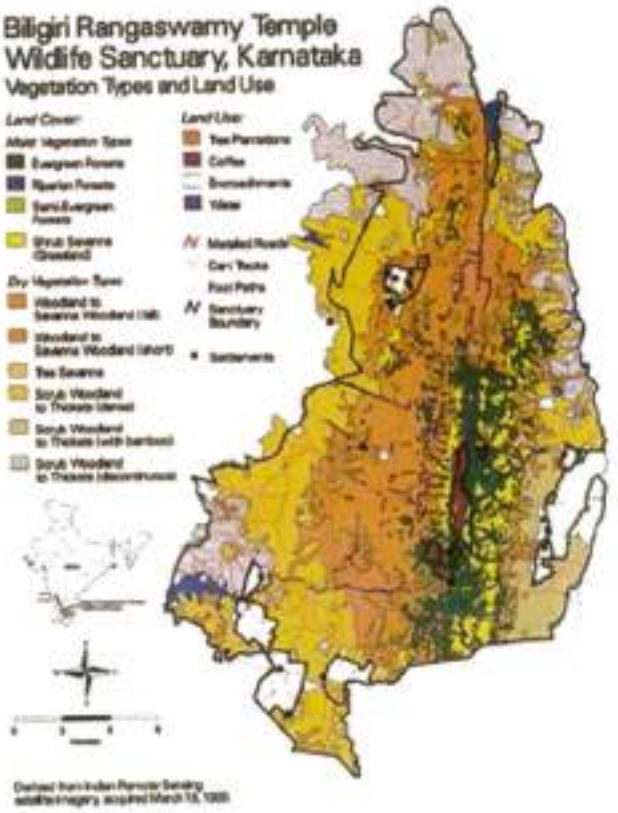
Objective : To document the Floral diversity of Biligiri Rangaswamy Temple Wildlife Sanctuary, and to bring out comprehensive floristic account of the sanctuary along with study of endemic plants, threat status and conservation measures.

Area and locality of the Allotted Project : *c.* 540 sq km, Chamrajnagar District, Karnataka

Background of the Project : The BiligiriRangaswamy Temple (BRT) Wildlife sanctuary (77°-77°16'E and 11°47'-12°09'N), was declared as a wildlife sanctuary on 1974 and as a Tiger reserve in 2010, comprising an area of *c.* 540 sqkm, is located in Karnataka in Peninsular India. Being located in confluence of Western Ghats and Eastern Ghats, it provides in-situ conservation of the unique ecosystems existing in that region and harbours the most extensive and the best preserved tropical forests in the state of Karnataka. A wide range of climatic and altitudinal variations have resulted in a highly heterogeneous landscape with various vegetation types such as scrub forests, dry deciduous forests, riparian forests, moist deciduous forests, evergreen forests, sholas and grasslands. A comprehensive floristic study of this protected area is very much essential for future research, management and conservation actions. So far no attempt of floristic documentation is available for this wildlife sanctuary as a whole and BRT wildlife sanctuary remained underexplored. Hence this present study was undertaken to bring out an up-to-date comprehensive account on the floral diversity of the entire BRT Wildlife Sanctuary.

Summary of the work done during 2014-15 : During this period, three field tours covering an area of 120 sqkm in Yelandur, K.Gudi forest areas, Punajanur range, Suvarnavathy area, Kollegal range, Bailur range, Doddasampige forests were undertaken. During these tours a total of 401 field numbers of plant specimens were collected out of which 235 field nos. belonging to 233 species were identified, GPS locations were noted down for all the collected species, about 200 photographs of plants and vegetation were taken, updated the nomenclature of 200 plant species mentioned in earlier works, documented 127 species and described 66 species.

Achievements/ Outcomes in 2014-15 : The study resulted in identification of 18 endemic and threatened species protected in the sanctuary. Some of which are *Andrographis serpyllifolia* (Vahl) Wight, *Argyreia cuneata* Ker Gawl., *Aristida stocksii* (Hook.f.) Domin, *Barleria mysorensis* B.Heyne ex Roth., *Bulbophyllum fischeri* Seidenf., *Capparis*



A mosaic of semi evergreen forest canopy in BRT WLS, Karnataka

Elaeocarpus serratus L.

rheedii DC., *Curcuma pseudomontana* J.Graham, *Decaschistia crotonifolia* Wight & Arn., *Diplocentrum recurvum* Lindl., *Eriolaena quinquelocularis* (Wight & Arn.) Wight, *Glossocardia bosvallia* (L.f.) DC., *Myristica dactyloides* Gaertn., *Phyllanthus indofischeri* Bennet, *Pterocarpus marsupium* Roxb. and *Zingiber neesanum* (J.Graham) Ramamoorthy.

Ex-situ conservation : A total of 28 threatened and economically important plants were collected and introduced in office garden. Some of which are *Bulbophyllum fischeri* (endemic Orchidaceae), *Diplocentrum recurvum* (endemic Orchidaceae), *Polystachya concreta* (Orchidaceae), *Bulbophyllum fuscopurpureum* (Orchidaceae), *Coelogyne breviscapa* (Orchidaceae), *Coelogyne odoratissima* (Orchidaceae), *Bulbophyllum fimbriatum* (Orchidaceae), *Dendrobium heterocarpum* (Orchidaceae), *Aerides cylindricum* (Orchidaceae), *Argyreia cuneata* (endemic Convolvulaceae), *Crinum latifolium* (Amaryllidaceae), *Chloroxylon swietenia* (Rutaceae), *Erythroxylon monogynum* (Erythroxylaceae), Saplings of *Coffea radiata* (Rubiaceae), Seeds of *Abrus precatorius*, *Shorea robusta* and *Phoenix sylvestris*, Cuttings of *Hibiscus mutabilis* (Malvaceae), Seeds of *Gomphocarpus physocarpus* (Asclepiadaceae), cuttings of *Hypericum mysorense* (Hypericaceae), *Ipomoea campanulata* (Convolvulaceae), *Chlorophytum* sp. (Liliaceae) and Ornamental Liliaceae.

4. Project : Foliicolous Fungi of Maharashtra

Executing Scientist : Dr. Rashmi Dubey

Date of initiation : November, 2010

Date to be completion : March 2016

Objective : The work was undertaken to explore, isolate, characterize, classify and preserve the foliicolous fungi of Maharashtra along with preparation of detail inventory of microfungi.

Area and Locality of the allotted Project : Maharashtra State.(3, 07, 690 sq.km).

Background of the project : The total fungal diversity is estimated to be between 1.5 and 5.1 million species. About one-third of the world mycota is known to be present in India. Maharashtra occupies a substantial portion of the Deccan plateau in the western peninsular part of Indian subcontinent and is blessed with biologically diversified areas which are known as 'biodiversity hotspots'. The state occupies 3,07,690 sq km geographical area out of which 63,798 sq.km is under forest cover. It is divided into high and low level tracts by Western Ghats which run parallel to the western coast. As this region is bestowed with diversified vegetation along with coastal flora and fauna the chances of occurrence of some interesting and fascinating fungi is gigantic. Only a fraction of total fungal wealth of this region has been subjected to scientific study. Discovery of missing fungi is the major challenge and leaf associated fungi (Foliicolous fungi) is a part of the same. No comprehensive and systematic studies have been undertaken on Foliicolous fungi of this region. Thus, the

Leaf blight in *Ziziphus rugosa* Lam.

Leaf spots of *Bridelia squamosa*

present work was undertaken to bring out the upto date comprehensive mycofloristic account of "Foliicolous Fungi of Maharashtra".

Summary of the work done during 2014-15 : During the year April 2014-March 2015, two fungal exploration tours of which one w.e.f. 19.9.2014 to 26.09.2014 in Nandurbar, Toranmal (Nandurbar Dist.), Aner Dam WLS (Dhule Dist.), Yawal WLS (Jalgaon Dist.) and their adjoining areas and another w.e.f. 8.02.2015 to 14.02.2015 in Radhanagri WLS (Kohlapur Dist.), Chandoli NP, Koyna WLS (Satara Dist.) and their adjoining areas were conducted. During these tours 375 field nos. of plant specimens were collected of which 338 host plant specimens and 285 fungal specimens were identified,78 fungal specimens were described and characterised, 500 photographs were taken and identified. During this year, one Herbarium Consultation tour w.e.f. 01.03.2015-05.03.2015 to Pathology Division, Forest Research Institute, Dehradun was also conducted. Incorporation of specimens during the study is under process.

This study also reports frequent occurrence of diseases like Powdery mildews, Rust, smuts, leaf spots and sooty molds diseases in surveyed area.

Achievements/ Outcomes in 2014-15 : During this study 67 new host records for Fungi of India, five (05)new fungal species to science (*Asterina koyanensis* sp.nov.; *Goosiomyces bambusicola* sp.nov.; *Solicorynespora matharensis*sp.nov.; *Stigmina koyanensis*sp.nov.; *Temeriomyces indicum*sp.nov., five (05) new records of India (*Aphanofalxmali* B. Sutton., *Parapericoniella asterinae* (Deighton) U. Braun; *Porrectotheca radiata* Matsush; *Veronaeopsis simplex* (Papendorf) Arzanlou & Crous.; *Tryblidiopycni spinastri* Hohn, six (06) new records of fungal species (*Aschersonia aleyroides* Webber; *Balla dynaugandensis* Syd. & P. Syd.; *Cladosporium aecidicola* Thuem; *Solicoryne sporainsolita* M. Hern; *Stemphylium solani* G.F. Weber; *Leptoxyphium glochidion* H. Yang & K.D. Hyde) were reported and all published new findings were submitted to Tropical Forest Research Institute, Jabalpur for updation in "***Authors of Indian Fungi***".

5. Project : Ferns of Karnataka

Executing Scientist : Dr. A. Benniamin

Date of initiation : 01 April 2014

Date to be completion : 31 March 2018

Objective : To bring out a comprehensive floristic account of ferns of the Karnataka.

Area and locality of the Allotted Project : Throughout Karnataka State (Map showing area surveyed-Kudremukh National Park).

Background of the Project : The Western Ghats of the Indian peninsula constitute one of the 34 global biodiversity hotspots along with Sri Lanka. The Western Ghats passes through the state of Karnataka which is exceptionally rich in flora. As far as Pteridophytic diversity is concerned only few sporadic works has been done. In order to fulfil this lacuna, the present study was undertaken. The aim is to bring out a comprehensive floristic account of fern wealth of the Karnataka by extensive and intensive exploration of this rich, but under explored area.

Summary of the work done during 2014-15 : One field tour to different parts of Kudremukh National Park, Karnataka was undertaken. During this tour 69 species of Pteridophytes were collected of which 65 species were identified and 28 species were described, 50 photographs were taken and properly identified, all the collected specimens were processed, identified and kept in Herbarium of BSI, WRC, Pune. During the study tour, the ecological attributes such as altitude, rainfall, temperature, forest types and soil type were recorded.

Achievements / Outcomes in2014-15 : 10 live fern specimens belonging to 10 species namely *Adiantum capillusveneris, Adiantum raddianum, Adiantum concinnum, Vittaria elongata, Pteris argyrea, Pteris biairita, Microsorium membranaceum, Pyrrosia porosa, Botrychium daucifolium* and *Asplenium indicum* were collected and introduced in the Office botanical garden. SEM study was carried out for studying spore ornamentation of 18 species namely *Botrychium daucifolium, Osmunda hugeliana, Bolbitis anguistipinna, Trignospora* sp., *Tectaria* sp., *Leptochillus decurrens, Arachniodes aristata, Cyathea* sp., *Psilotum nudum, Diplazium brachylobum, Pteris vittata, Botrychum lanuginosum, Adiantum lunulatum* and *Huperzia phelgemaria.*

Syzygium laetum (Buch.-Ham.) Gandhi

NEW DISCOVERIES

Anoectochilus roxburghii

NEW DISCOVERIES

Plant diversity in India is highly influenced by different floristic elements from three major biogeographical realms, namely Indo-Malayan the Indo-Arctic (Eurasia) and Afro-tropical. The Indian flora mainly is concentrated in four hotspots viz., 1. Indo-Burma covering Mizoram, Manipur, Nagaland, Meghalaya, Tripura and Andaman Islands, 2. Himalaya covering Jammu & Kashmir, Himachal Pradesh, Uttarakhand, northern part of West Bengal (Darjeeling), Sikkim, northern part of Assam and Arunachal Pradesh, 3. Western Ghats consisting of the states of Kerala, Karnataka, western parts of Tamil Nadu, Goa, western parts of Maharashtra and southern Gujarat and 4.The Sundaland covering the Nicobar Islands, which are identified amongst the thirty four 'global biodiversity hotspots'. The varied edaphic, climatic and topographic conditions and altitudinal variations have resulted in a wide range of ecosystems and habitats such as forests, grasslands, wetlands, deserts, and coastal and marine ecosystems which exhibit an extraordinary floristic diversity. These regions show high degree of endemism and higher incidence of rare and threatened plant species also.

Current estimations revealed, a total of 18159 species of angiosperms, 77 species of gymnosperms,1274 species of pteridophytes, 14936 species of fungi, 2531 species of bryophytes and 2434 species of lichens in India, which is approximately 11.4 per cent of the total recorded plants species of the World. The knowledge on the flora is improving rapidly by floristic explorations and documentation which result in many new discoveries. The group wise current status of number of species known from India are given below :

Adenophora capillaris Hemsley

Group	No. of Species in India	Per cent of Indian Flora
Virus/ Bacteria	1071	2.24
Algae	7308	15.29
Fungi	14,936	31.26
Lichens	2434	5.09
Bryophytes	2531	5.29
Pteridophytes	1274	2.67
-Gymnosperms	77	0.17
Angiosperms	18,159	37.99
Total	47,790	100

During the year 2014-15, scientists of BSI discovered 01 new genus, 52 new species, 10 new infraspecific taxa from India while new distributional records of two (2) genera, 47 species and two subspecies were reported for the first time from India.

Seed plants contributed the maximum with 52 per cent of the total discoveries followed by Lichens by 19 per cent, Fungi by 17 per cent of the total discoveries. Pteridophytes, Bryophytes and algae contributes 4 percent respectively of the total discoveries during the year 2014-15.

The list of new discoveries and the locations given below.

NEW TO SCIENCE

SEED PLANT

Adinandra kamalae M.K.Pathak, Bhaumik & G. Krishna, (Pentaphylacaceae): described from Tuting to Nereng, Upper Siang district of Arunachal Pradesh.

Bulbophyllum cherrapunjeensis Barbhuiya & D.Verma, (Orchidaceae) : described from Cherrapunjee, East Khasi district of Meghalaya.

Bulbophyllum manabendrae D. K. Roy, Barbhuiya & A. D. Talukdar, (Orchidaceae): described from Balphakram National Park, Khundol Gup, South Garo Hills district of Meghalaya.

Chrysosplenium arunachalense Bhaumik, (Saxifragaceae) : described from Renu II, Pass beyond Yourlung, West Siang district of Arunachal Pradesh.

Cleistanthus nokrensis B. Singh, (Euphorbiaceae) : described from Nokrek Biosphere Reserve, Rongsingiri, of Meghalaya.

Adinandra kamalae M.K.Pathak, Bhaumik & G. Krishna

Chrysosplenium arunachalense Bhaumik

Crotalaria shuklae Arjun Prasad Tiwari & Anis Ahmad Ansari, (Fabaceae) : described from Chakarnagar in Etawah district of Uttar Pradesh.

Curcuma mukhraniae R. Kr. Singh & Arti Garg, (Zingiberaceae) : described from Mookambika Wildlife Sanctuary, Kollur of Udupi District of Karnataka.

Cycas darshii R. C. Srivast. & B. Jana, (Cycadaceae): described from Acharya Jagdish Chandra Bose, Indian Botanical Garaden, Howrah district of West Bengal.

Cycas sainathii R.C.Srivast., (Cycadaceae): described from Acharya Jagdish Chandra Bose, Indian Botanical Garaden, Howrah district of West Bengal.

Dactylicapnos arunachalensis Liden& M. K. Pathak, (Papaveraceae): described from Dibang valley, Kupup to Geyling, Upper Siang District, of Arunachal Pradesh.

Eria gloensis Ormerod & Agrawala, (Orchidaceae): described from Mishmi Hills, Kamlang Valley, Glo of Arunachal Pradesh.

Glochidion kingii M. V. Ramana, Sanjappa, Venu & Alok Chorghe, (Phyllanthaceae): described from Saddle Peak National Park, Kalpong River, North Andaman Islands, Andaman & Nicobar Islands.

Glochidion tirupathiense Rasingam, Chorghe, Prasanna & Sankara Rao, (Phyllanthaceae): described from Tirumala hills, on the way to Kumaradara Pusupudara Dam in Andhra Pradesh.

Habenaria nicobarica Murugan, Alappatt, Prabhu & Arisdason, (Orchidaceae): described from Little Nicobar Tribal Reserve, Pulopaha, South Nicobar of Andaman and Nicobar Islands.

Habenaria osmastonii Karthig.Maina, Sumathi, Jayanthi & Jalal, (Orchidaceae): described from Rutland Island, Dyer Point, South Nicobar Islands.

Bulbophyllum cherrapunjeensis Verma, D., Barbhuiya, H.A. and Lavania, S

Impatiens paramjitiana Gogoi & Borah, (Balsaminaceae): described from Daporijo, Along, West Sian district of Arunachal Pradesh.

Ixora chakraborteyi Murugen & Prabhu, (Rubiaceae): described from Katchal Island towards Kapanga, Andaman & Nicobar Island.

Impatiens paramjitiana Gogoi & Borah

Kobresia brandisii C. B. Clarke ex Jana & R. C. Srivastava, (Cyperaceae): described from Westren Himalaya, Uttarakhand.

Kobresia paramjitii Jana, H.J.Noltie, R.C. Srivast & Ambarish Mukherjee, (Cyperaceae): described from North slopes above Sebu-La of North Sikkim district of Sikkim.

Kobresia vibhae Jana, R.C.Srivast & Manas Bhaumik, (Cyperaceae): described from Mobo Mountain top Upper Siang district of Arunachal Pradesh.

Musa argentii Gogoi & Borah, (Zingiberaceae): described from 12 km along the road to Deban from the zero point junction at Wakro,Lohit district of Arunachal Pradesh.

Musa indandamanensis L. J. Singh, (Zingiberaceae): described from Hut Bay, Krishna Nalah, Little Andaman, Andaman & Nicobar Islands.

Musa nagalandiana S. Dey&Gogoi, (Zingiberaceae): described from Makham village near V. K. Town at Zunheboto district ofNagaland.

Picrorhiza tungnathii Pusalkar, (Scrophulariaceae): described from Tungnath, Rudraprayag district of Uttarakhand.

Pternopetalum arunachalense M. Bhaumik & P. Satyanar., (Apiaceae) : described from Mechukha to Yourlung near Hanuman camp, West Siang district of Arunachal Pradesh.

Rhynchosia ravii K.Prasad & A.Naray. (Leguminosae :Papilionoideae): describedfrom Anantapuram district, Talapula forest of Adhra Pradesh.

Sauromatum meghalayense D.K. Roy, A.D. Talukdar, B.K. Sinha & M. Dutta Choudhury, (Araceae): described from Hatisia, South Garo Hills district of Meghalaya.

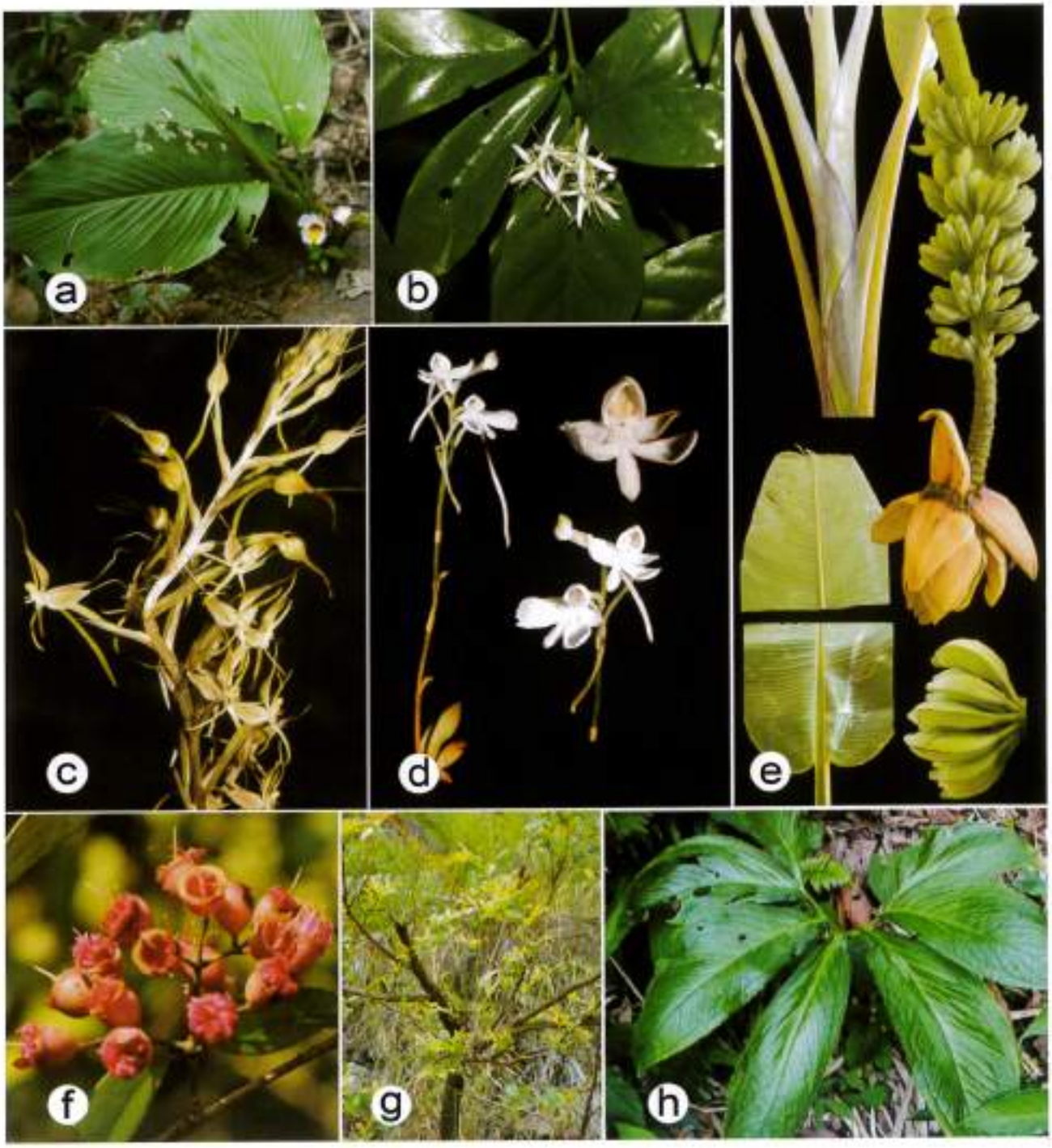
Staurogyne andamanica M. V. Ramana, Sanjappa, Venu & Chorghe, (Araceae): described from Saddle Peak National Park, Kalpong, North Andaman Island, Andaman & Nicobar.

Syzygium hookeri M. V. Ramana, Chorghe &Venu, (Myrtaceae): described from Saddle Peak National Park, Kalipur, Andaman Island, Andaman & Nicobar.

Syzygium sanjappaiana M.V. Ramana, (Myrtaceae): described Saddle Peak National Park, Andaman Island of Andaman & Nicobar.

Musa aurantiaca Baker var. **homenborgohainiana** Gogoi, (Zingiberaceae): described from Kayeng to Tato, west Siang district of Arunachal Pradesh.

Musa aurantiaca Baker var. **jengingensis** Gogoi, (Zingiberaceae): described from Upper Siang district of Arunachal Pradesh.



a. *Curcuma mukhraniae* R. Kr. Singh & Arti Garg; b. *Ixora chakraborteyi* Murugen & Prabhu; c. *Habenaeria nicobarica* Murugen & al., d. *Habenaria osmastonii* Karthig.; e. *Musa nagalandiana* S. Dey & Gogoi; f. *Syzygium hookeri* M. V. Ramana & al; , g. *Glochidion tirupathiense* Rasingam & al; h. *Sauronatum meghalayense* D.K. Royal.

Musa mannii Baker var. **namdangensis** Gogoi & Borah, (Zingiberaceae): described from Changlang, Changlang district of Arunachal Pradesh.

Phanera glauca Benth.subsp. **tenuiflora** (Watt ex C.B. Clarke) A. Schmitz var. **gandhiana** Gogoi & Bandyop., (Fabaceae): described from Changwanti and Walong, Anjaw district of Arunachal Pradesh.

Phanera glauca subsp. **tenuiflora** var. **murlenensis** Ram Kumar, Bandyop.et S.Sharma, (Fabaceae): described from Murlen National Park, between Vapar and Nagur of Mizoram.

PTERIDOPHYTES

Pichisermollodes frasaer-jenkinsii Kholia, (Polypodiaceae): described from Singba Rhododendron Sanctuary, Sikkim.

Tectaria coadunata (Wall. ex Hook.&Grev.) C.Chr. var. **elongata** Kholia, (Dryopteridaceae): described from Bermellii and Manebhangyang area of South district of Sikkim.

Polystichum thomsonii (Hook. f.) forma **himalaicum** Kholia, (Dryopteridaceae): described from Talam, Kyangnosla, Lachen and Kataw in Sikkim.

Thelypteris (Stegnogramma) mollissima var. **truncata** Kholia, (Thelypteridaceae): described from Bansoi area of North Sikkim.

LICHENS

Bactrospora littoralis Jagadeesh, (Roccellaceae): described from Andaman Islands, North Andaman.

Bactrospora medians Jagadeesh (Roccellaceae): described from Reef Island Wildlife Sanctuary, North Andaman and Henry Lawrence Island of South Andaman.

Caloplaca indica Y. Joshi, Jagadeesh & G.P. Sinha, (Teloschistaceae): described from Kalimpong, Neora Valley National Park, Aloobari Darjeeling district, West Bengal and West Kameng of Arunachal Pradesh.

Graphis manipurensis Pushpi Singh & Kr. P. Singh

Chiodecton andamanicum Jagadeesh, (Roccellaceae): described from Andaman Islands, South Andaman, John Lawrence Island.

Graphis manipurensis Pushpi Singh & Kr. P. Singh (Graphidaceae): described from Chandel district, Tengnoupal, Manipur.

Graphis sirohiensis Pushpi Singh & Kr. P. (Graphidaceae): described from Ukhrul district, Manipur.

Heiomasia pallescens Jagadeesh, (Graphidaceae): described from Hut Bay, Nanjappa Nagar Little Andaman Island.

Herpothallon coralloides Jagadeesh, (Arthoniaceae): described & collected from on *Rhizophoramucronata* in Mangrove forest Baratang Island, Naya Dera, Andaman Islands.

Herpothallon globuliferum Jagadeesh, (Arthoniaceae): described from on leaves of *Heritieralittoralis* in Mangrove forest, Naya Dera, Baratang Island, Andaman Islands.

Herpothallon lutescens Jagadeesh, (Arthoniaceae): described from inland forests of Little Andaman Island, Andaman & Nicobar.

Herpothallon minutum Jagadeesh, (Arthoniaceae): described from seashore and inland forests of the Andaman Islands, Andaman & Nicobar.

Sagenidiopsis atroalba Jagadeesh, (Roccellaceae): described from Mount Harriet National Park, South Andaman, Andaman & Nicobar Island.

FUNGI

Sheathnema Dubey and Moonnambeth, (Stillbellaceae): described from Sawantwadi Taluka, Sindhudurg district of Maharashtra.

Custingophora ratnagiriensis Dubey & Moonnambeth,: described from Panval, Ratnagiri of Maharashtra.

Goosiomyces bambusicola Dubey and Moonnambeth, described from KurneLanja, Ratnagiri of Maharashtra.

Lactarius vesterholtii K. Das & D. Chakr., (Russulaceae): described from Bansoi, North district of Sikkim.

Sheathnema indicum Dubey and Moonnambeth, (Stillbellaceae): described from Sawantwadi Taluka, Sindhudurg district of Maharashtra.

Vermiculariopsiella papaye Dubey. (Helminthosphaeriaceae): described from BSI garden, Pune, Maharashtra.

Zygosporium cocos Dubey & Moonnambeth; described from BSI garden, Pune, Maharashtra.

Zygosporium dilleniae Dubey & Moonnambeth; described from Sawantwadi district of Maharashtra.

ALGAE

Johannesbaptistia desikacharyi Raj. K. Gupta & Sudipta K. Das, (Entophysalidaceae): described from Karamdah Ghat, Jamtara, Jharkhand.

NEW DISTRIBUTIONAL RECORDS

SEED PLANT

Acrotrema costatum Jack. (Dilleniaceae): collected from Kamba to Along, West Siang district of Arunachal Pradesh.

Adonis davidii Franchet, (Ranunculaceae): collected from lamang Camp, West Siang district of Arunachal Pradesh.

Arisaema bannaense H. Li, (Araceae) : collected from Sessa, behind Military Base, West Kameng district of Arunachal Pradesh.

Arisaema lingyunense H. Li, (Araceae): collected from Dzukou Valley, at border of Manipur and Nagaland.

Centratherum punctatum Cass. subsp. **punctatum** Kirkman, (Asteraceae): collected from Bogamati, Barnadi wildlife Sanctuary, Udalguri district of Assam.

Codonopsis tubulosa Kom. (Campanulaceae): collected from Dzukou valley, Manipur and Nagaland border.

Cotoneaster chengkangensis T.T. Yu (Rosaceae): from Mechukha, West Siang district of Arunachal Pradesh.

Dendrophthoe glabrescence (Blakely) Barlow (Loranthaceae): collected from Hut Bay Little Andaman, Andaman & Nicobar Island.

Hypericum Petiolatum subsp. **Yunnanense** (Franch.) N. Robson (Hypericaceae): collected from Manigong, West Siang district of Arunachal Pradesh.

Kobresia kanaii Rajbh. & H.Ohba (Cyperaceae) : collected from Kupup, East Sikkim district of Sikkim.

Leptomischus primuloides Drake (Rubiaceae): collected from West Siang district of Arunachal Pradesh.

Macrosolen melintangensis (Korth.) Miq. (Loranthaceae): collected from Dhanikari, South Andaman, Andaman & Nicobar Island.

Mazus celsiodes Hand.-Mazz. (Scrophulariaceae): collected from Menchukha, West Siang district of Arunachal Pradesh.

Miliusa amplexicaulis Ridl. (Annonaceae): collected from Laful, Great Nicobar Island, Andaman & Nicobar.

Oreorachis patens Lindley (Orchidaceae): collected from Triyuginarayan, Rudraprayag district of Uttarakhand.

Ormosia pinnata (Lour.) Merr., (Fabaceae): collected from Phulertal forest , Cacher of Assam.

Pogonia japonica Rchb. (Orchidaceae): collected from Mechukha, West Siang district of Arunachal Pradesh.

Pternopetalum gracillimum (H. Wolff) Hand-Mazz. (Apiaceae):): collected from Lamang-Lolla Pass, West Siang district of Arunachal Pradesh.

Pterygiella bartschioides Hand—Mazz. (Orchidaceae): collected from Mobo Mountain top near Tato, West Siang district of Arunachal Pradesh.

Schisandra incarnata Stapf. (Schisandraceae): collected from Nying to Detung Camp, Manigong, West Siang district of Arunachal Pradesh.

Solidago dahurica (Kitag.) Kitag.Ex Juz. (Asteraceae): collected from Chitkul, Kinnaur of Himanchal Pradesh.

Swertia handeliana Harry Sm. (Gentianaceae): collected from Mobo mountain top near Tato, West Siang district of Arunachal Pradesh.

PTERIDOPHYTES

Cheilanthes tibetica Fraser-Jenk. & Wangdi (Pteridaceae): collected from Lachung Kataw Road , Sikkim.

BRYOPHYTES

Bazzania bhutanica N.Kitag. & Grolle (Lepidoziaceae): collected from West Siang district of Arunachal Pradesh.

Cheilolejeunea osumiensis (S.Hatt.) Mizut. (Lejeuniaceae): collected from Anjaw district of Arunachal Pradesh.

Plagiochila gymnolada Sande Lac. (Plagiochilaceae): collected from West Siang district of Arunachal Pradesh.

Pseudolepicolea fryei (Perss.) Grolle & Ando (Pseudolepicoleaceae): collected from on way to Hemkund Sahib, Chamoli District of Uttarakhand.

LICHEN

Dictyonema C. Agardh ex Kunth (Hygrophoraceae): collected from Campbell Bay, Govind Nagar Great Nicobar Island, Andaman & Nicobar Island.

Arthonia reidngeri Grube. (Arthoniaceae): colleted from East Khasi district, Meghalaya.

Bactrospora carolinensis (Ellis &Everh.) R.C. Harris (Roccellaceae): collected from truck of Coconut tree at Long Island, Andaman Islands.

Cyphelium inquinans (Sm.) Trevison (Caliciaceae): collected from hot spring, Lohit district, Arunachal Pradesh.

Dictyonema irrigatum (Berk.& M.A. Curtis) Lücking. (Hygrophoraceae) : collected from Great Nicobar Island, Campbell Bay, Govind Nagar, Andaman & Nicobar.

Opegrapha apomelaena A. Massal. (Roccellaceae): collected from Reef Island of North Andaman and Henry Lawrence Island of South Andaman.

Opegrapha dekeselii Ertz (Roccellaceae): collected from Andaman Island.

Opegrapha irosina Vain. (Roccellaceae): collected from John Lawrence Island of Andaman.

Opegrapha robusta Vain. (Roccellaceae): collected from Andaman Island.

FUNGI

Acarocybellina (Matsush.) Subram.; collected from Sawantwadi forest in Sindhudurg District of Maharashtra.

Acarocybellina arengae (Matsush.) Subram.; collected from Sawantwadi forest in Sindhudurg District of Maharashtra.

Catenularia cubensis Hol-Jech (Chaetosphariaceae) : collected from Garden of Botanical Survey of India, Western Regional Centre, Pune, Maharashtra.

Cucurbidothis pithyophila (Schmidt and Kunze) Petr.; collected from Garden of Botanical Survey of India, Western Regional Centre, Pune, Maharashtra.

Hemibeltrania nectandrae (Batista & Maia) Pirozynski; collected from Lonavala of Maharashtra.

Idriella lunata P. E. Nelson & S. Wilhelm (Helotiaceae): collected from Koyna, Satara, Maharashtra.

Mycovellosiella solani-torvi (Frag.&Cif.) Deighton (Mycosphaerellaceae): collected from Sawantwadi, Maharashtra.

Periconiella telopeae (Hansf.) M. B. Ellis (Mycosphaerellaceae): collected from Sawantwadi, Maharashtra.

Phragmospathula brachyspathula Mercado; collected from Garden of Botanical Survey of India, Western Regional Centre, Pune, Maharashtra.

Physopella hiratsuke (Syd.) Cummins & Ramachar. (Phakopsoraceae): collected from Malshej Ghat, Thane District of Maharashtra.

ALGAE

Chlorococcum ellipsoideum Deason & H. C. Bold; collected from Manshu lake, East Sikkim, Sikkim.

Dictyochloropsis splendida Guitler; collected from Nagula lake, Tawang district, Arunachal Pradesh.

Neospongiococcum gelatinosum (P.A. Archibald & H.C. Bold) H. Ettl& G. Gartner; collected from Paradise lake, Tawang district, Arunachal Pradesh.

Pennilabium labanyaranum
C.Deori, N.Odyuo & A.A.Mao

Rhododendron mechukae
A. A. Mao & Ashish Paul

Zingiber bipinianum

ex situ CONSERVATION

The Botanical Survey of India is the leading National Institute under Ministry of Environment, Forests and Climate Change in the field of taxonomy, has designated botanic gardens in different phytogeogrphical regions of India. There are total 10 botanic gardens under BSI and its regional centers which are doing excellent work in the field of ex-situ conservation and botanic garden education.

Sl. No	Name of the Garden	Regional Centre Jurisdiction	Focal Area
1.	AJC Bose Indian Botanic Garden	Howrah	Trees species, Bamboos
1.	Experimental Garden, Barapani	Shillong	Zingiberaceae and Orchids
2.	Experimental Garden, Dhanikheri	Port Blair	Medicinal Plants
3.	National Orchidarium and Experimental Garden, Yercaud	Coimbatore	Orchid
4.	National Gymnosperm collection cum Botanic Garden, Pauri	Dehradun	Gymnosperm
5.	Experimental Garden, Senki View	Itanagar	Indigenous species of Arunachal Pradesh
6.	Botanic Garden of Indian Republic	Noida	Arboreta, Woodland and Botanic Garden Education
7.	Experimental Garden, Gangtok	Gangtok	Pteridophytes and Orchids
8.	Experimental Garden, Jodhpur	Jodhpur	Arid plants
9.	Experimental Garden, Mundhwa	Pune	Pteridophytes and Gymnosperms
10.	Experimental Garden	Allahabad	Wild Rose and its cultivars

Ex-situ conservation in Indian Botanic Gardens

The plants that are conserved in Botanical Survey of India experimental garden are

A: Ex situ Conservation of Rare / Threatened / Endemic:

1. NRC, BSI, Dehra Dun:

Withania coagulans, *Tecomella undulata* (From Jodhpur); *Wigandia kunthii*, *Catamixis baccharoides*, *Iris kemaonensis*, *Cymbidium* sp., *Dendrobium* sp., *Neolitsea* sp., *Calanthe* sp. (Alaknanda), *Indopiptadenia oudhensi* (Sohelwa, Balrampur); *Meizotropis pellita* (Nainital), *Paris polyphylla*, *Hedychium spicatum*, *Lilium polyphyllum*, *Malaxis muscifera*, *Anemone raui*, *Dryopteris cochleata*, *Osmunda claytoniana*, *Catamixis baccharoides* (Upper Mandakini valley) *Paphiopedilum villosum*, *Nepenthes khasiana*, *Cythaea gigantean*, *Kaempferia rotunda*, *Trachycarpus martianus* (Shillong, Meghalaya).

2. APRC, BSI, Itanagar:

Phaiusmis lunensis (Orchidaceae); *Parakaempferia synantha* and *Larsenianthus* sp. of (Zingiberaceae)

3. ERC, BSI, Shillong:

- Different species of *Musa*, *Bamboos*, *Zingibers*, *Pipers*, *Citrus*, *Orchids*, Tree ferns and Insectivorous plants species of North east India.
- *Nepenthes khasiana*, *Citrus indica*, *Aquilaria malacensis*, *Aesculus assamica*, *Brainea insignis*, *Magnolia hodgsonii*, *Cycas pectinata*, *Ilex khasiana*, *Musa velutina*, Zingiberacean species like *Amomum sericeum*, *Amomum subulatum*, *Alpinia nigra*, *Caulokaempferia secunda*, *Curcuma aurantiaca*, *Curcuma amada*, *Globba spathulata*, *Kaempferia rotunda*, *Kaempferia galanga*, *Zingiber rubens*, *Zingiber roseum*, *Zingiber meghalayense*, *Costus lacerus*, and orchids like *Anoectochilus roxburghii*, *Acanthephippium sylhetense*, *Bulbophyllum rothschildianum*, *B. ambrosia*, *Iridium lancifolium*, *Cymbidium dayanaum*,

Cleistcentron pallens, Eria stricta, Eria paniculata, Flickingeria abhaycharanii, Holcoglossum amesianum, Hygrochilus parishii, Neogyna gardneriana, Paphiopedilum venustum, P. fairrieanum, Phaius flavus, Pleione maculata, Liparis bootanensis, Renanthera imschootiana, Stereochilus hirtus, Vanilla pilifera etc.

- Several interesting and curious plant species like *Gnetum gnemon, Gymnocladus assamicus and Panax assamicus, Bambusa pallida, Bambusa cacharensis, Bambusa vulgaris, Coptis teeta, Mangifera sylvatica, Mesua ferrea, Albizia arunachalensis Ginkgo biloba* are being conserved at ERC.

RET Live plants collected and introduced in the Garden: 2014-2015 : *Acampe rigida, Aerides odorata, Ardisia solanacea, *Artabotrys hexapetalus, Bauhinia acuminata, Chonemorpha fragrans, *Cycas pectinata, Dendrobium acinaciforme, *Dendrobium delacourii, Dendrobium moschatum, Dillenia pentagyna, Dipterocarpus tuberculatus, Leea rubra, Ochna squarrosa, *Paphiopedilum* sp., *Phoebe haenesiana, Pinalia elata, *Platycerium wallichii, Pteroceres teres, *Renanthera imschootiana, Thunia alba, *Vanda coerulea,* several *Zingiber* spp.

4. SRC, BSI, Combatore:

Acampe rigida, Anoectochilus elatus, Brachycorythis splendida, Calanthe masuca, Coelogyne flaccida, Coelogyne ovalis, Coelogyne nervosa, Cymbidium bicolor, Dendrobium wightii, Dendrobium nanum, D. heterocarpum, Eulophia epidendraea, Habenaria crinifera, Habenaria grandifloriformis, Habenaria heyneana, Habenaria longicorniculata, Habenaria rariflora, Habenaria roxburghii, Geodorum densiflorum, Liparis atroparpurea, Liparis viridiflora, Nervilia plicata, Oberonia brunoniana, Peristylis richardianus, Pinalia mysorensis, Satyrium nepalense, Sirhookera lanceolata and *Tainia bicornis*

Dipcadi montanum var. *madrasicum, Scilla hyacinthine, Iphigenia stellate, Drosera peltata, Drosera burmanni, Juncus prismatocarpus, Impatiens chinensis, Plectranthus barbatus*

5. ANRC, BSI, Port Blair:

Adonidia merrilli (03 Nos.); *Attalea speciosa* (02 Nos.); *Canophyllum falcatum* (30 Nos); *Calamus andamanicus* (28 nos.); *Cerbera manghas* (10 Nos.); *Chrysophyllum cainita* (02 Nos); *Cycas zeylanica* (35 Nos); *Hyphaene thebaica* (03 Nos); *Mimusops andamanensis* (31 Nos.); *Musa indandamansis* (10 Nos.); *Myristica andamanica* (50 Nos.); *Myristica elliptica* (60 Nos.); *Normanbya normanbyi* (01 No); *Pinanga andamanensis* (01 No); *Podocarpus nerifolius* (30 Nos.), *Terminalia manii* (15 Nos.) ; *Victoria amazonica* (20 Nos.)

B: IN VITRO / Micropropagation of RET Plants:

- *Pittosporum eriocarpum* : Micropropagation protocol has been standardized for the successful clonal propagation.
- *Indopiptadenia oudhensis* : Screening this plant under growth regulators for the callus induction in different young meristematic tissues and incipient callusing has been achieved.
- *Armodorum senapatianum, Cymbidium tigrinum, Rhododendron coxianum, Ilex khasiana, Paphiopedilum hirsutissimum*

(Note: Completed experiments for micropropagation of *Armodorum senapatianum, Cymbidium tigrinum, Rhododendron coxianum*)

- Experiment for micropropagation of *Armodorum senapatianum* using MS medium with different additives has been completed and transferred 200 plantlets to greenhouse for hardening in Charcoal: bricks = 3:1 ratio.
- Subculture of *Cymbidim tigrinum* at regular period was done. 100 plantlets were transferred to Soil: sphagnum in the ratio 3:1.Experiment for multiple shoot induction and callus induction using WPM medium with different concentration of PGRs were completed. Both multiple shoots and callus observed.
- Using nodal segment of stems of *Ilex khasiana* experiment was initiated. Few shoots developed. An experiment was done using vegetative parts of *Paphiopedilum hirsutissimum* for multiple shoot induction. Contamination occurred and therefore standardising the process of surface sterilization.

Micropropagation, Phytochemical Screening of Medicinal Plants and Molecular Characterization of Selected Species of NE India:

Paris polyphylla : Young leaves, mature seeds and rhizomes were collected and used for the micropropagation studies. The explants were inoculated on MS basal medium supplemented with different concentrations of plant growth regulators for callus induction and direct shoot induction.

Pyrenaria khasiana : Fruits and young seedlings were collected from Dullung Reserve forest, North Lakhimpur, Assam. The explants (seeds and *in vitro* raised leaves) were inoculated on Woody Plant Medium and MS medium supplemented with different concentrations of plant growth regulators for callus induction and direct shoot induction. Experiments with explants (seeds and *in vitro raised* leaves) of *Pyrenaria khasiana* were used with different plant growth regulators for callus induction and direct shoot induction and Woody Plant Medium was found to be best. More experiments need to be conducted for standardizing the protocol.

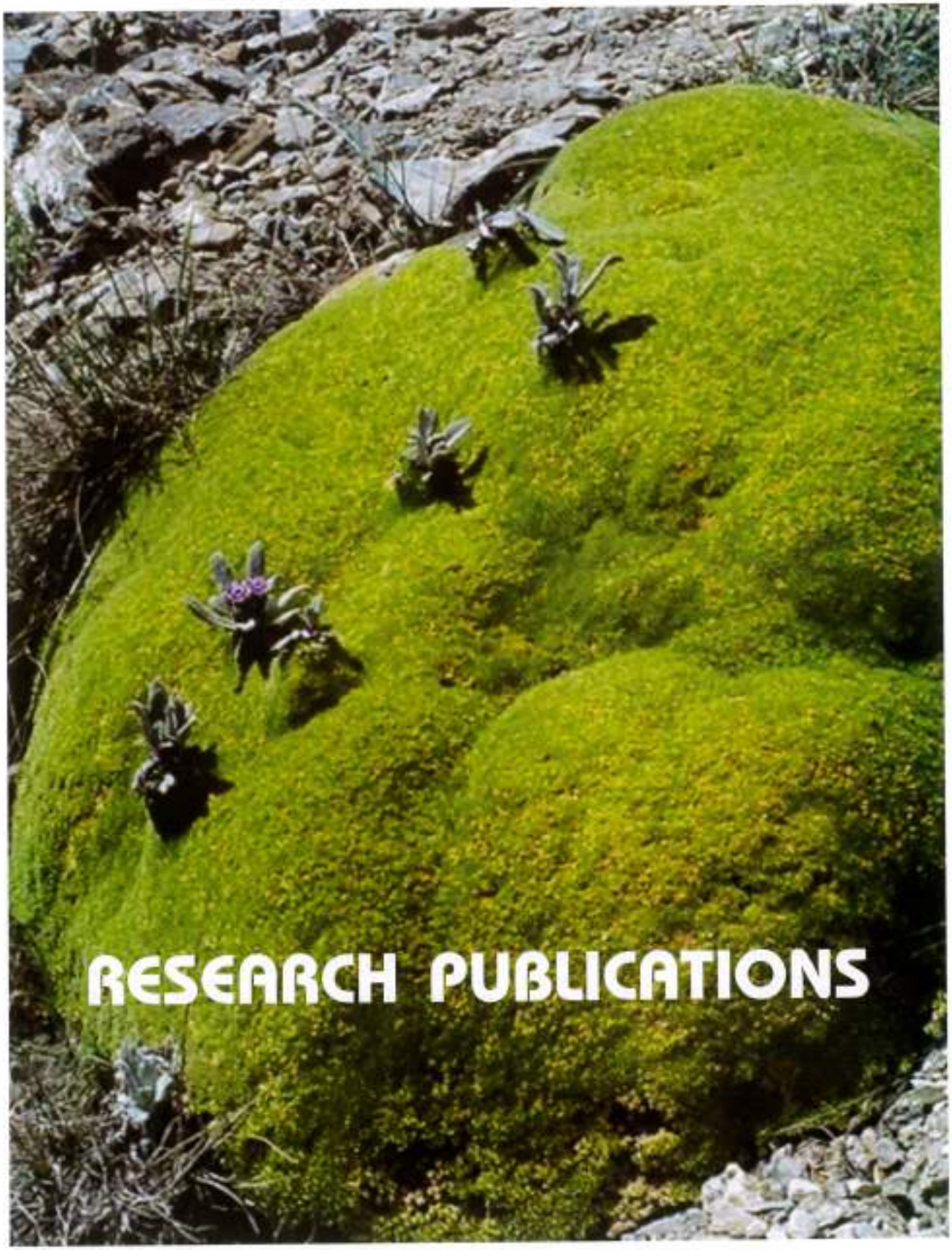
Preliminary qualitative phytochemical analysis was completed with the leaf samples (hot water extract)of

Aristolochia saccata, *Citrus latipes* and *Paris polyphylla*. Standardized DNA extraction protocol for the selected species. DNA extraction is completed with leaf samples of *Paphiopedilum venustum* (both Meghalaya and Arunachal Pradesh). DNA extraction is completed with leaf samples of *Rhododendron formosum* var. *formosum* and *Rhododendron formosum* var. *inaequale*. Standardized PCR protocol using RAPD markers. About 2000 seedlings of *R. wattii* and 1000 *R. macabeanum* are raised *in vitro*.

Ormosia robusta Around 350 seedlings were collected from natural habitat and planted in the green house of ERC, Shillong out of which few seedlings were planted in Barapani Experimental Garden of ERC, Shillong for *ex situ* germplasm conservation. Vegetative propagation for *Coptis teeta* through splitting of rhizomes from last year's 3 pots was done and planted in different pots for multiplication (16 pots) and maintenance in the green house of BSI, ERC, Shillong. Macropropagation of *Coptis teeta* through root cutting is standardized.

Coelogyneschultesii S.K. Jain & S. Das

Pittosporum eriocarpum Royle



Thylacospermum caespitosum

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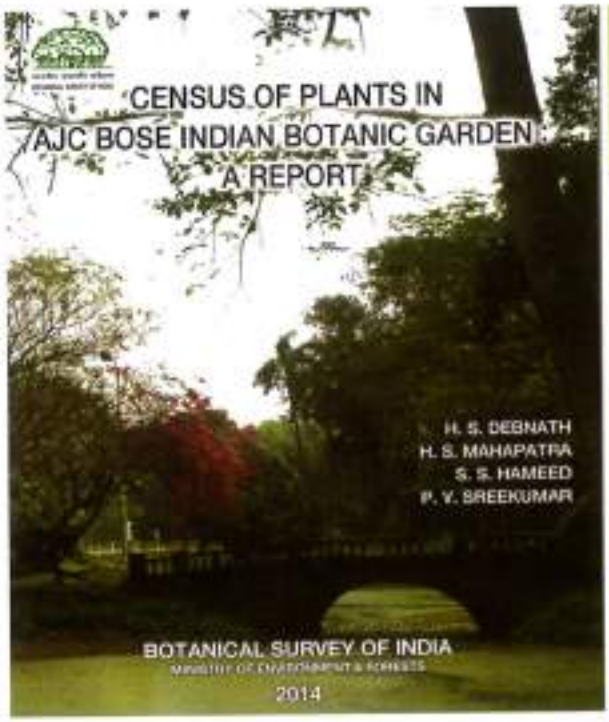

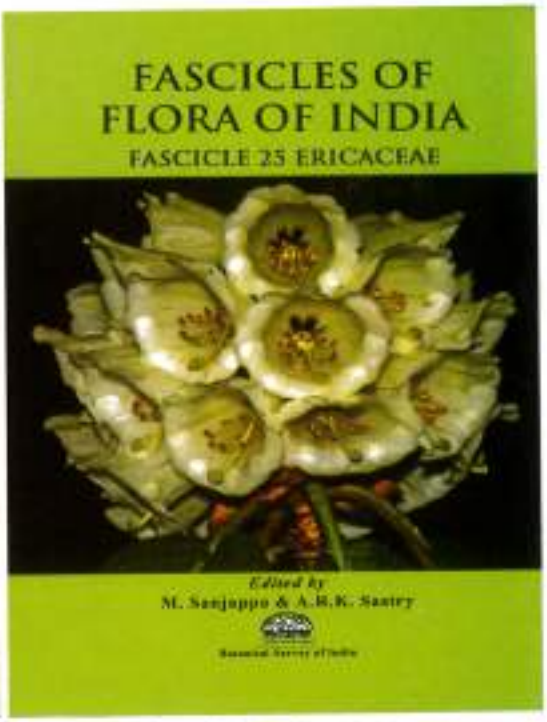

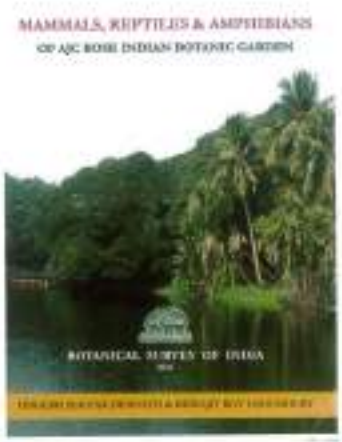

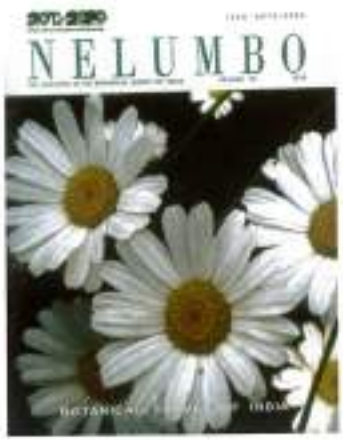

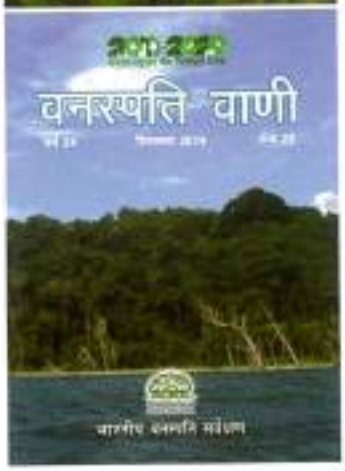

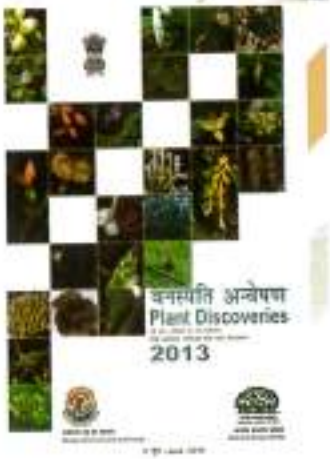

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Seminar/Symposium/Conferences attended

Dr. Kumar Ambrish

Delivered an oral presentation on *Wetlands Vegetation and Conservation* on the occasion of 125th Birth Anniversary of Botanical Survey of India at BSI, NRC, Dehradun on 13.02.2015.

Attended *Spring Festival, 2014*" w.e.f. 22.02.2015 to 23.02.2015 held at Raj Bhavan, Dehradun, as Competition judge.

Attended a workshop on "Ecosystem Services and innovative financing mechanism in the State of Uttarakhand" on dated 23rd March 2015 at Graphic Era University, Dehradun as an invited expert in Biodiversity and management session organized by Uttarakhand Science Education & Research Centre (USERC), Dehradun and GB Pant Institute of Himalayan Environment & Development (GBPIHED), Almora.

Attended meeting on the eve of "International Biological Diversity Day" on 22nd May,14 organized by BSI, NRC, Dehradun.

Attended "World Environmental Day" on 5th June,14 organized by BSI, NRC, Dehradun.

Attended Hindi week (13.09.2014-19.09.2014) and also attended the celebration of the Himalayan day (09.09.2014) at BSI, NRC, Dehradun.

Dr. R. Manikandan

Participated and presented an oral presentation on *Floristic diversity of Protected area Network with special reference to Govind Pashu Vihar WLS* on the occasion of 125th Birth Anniversary of BSI at NRC, Dehradun on 13.02.2015. Also attended queries from students regarding the documentary video of Herbarium methodology which was showed on the said occasion.

Attended meeting on the eve of *"International Biological Diversity Day"* on 22nd May, 2014 organized by BSI, NRC, Dehradun.

Attended meeting on the eve of "*World Environmental Day*" on 5th June, 2014 organized by BSI, NRC and also participated in *Parthenium* eradication programme.

Attended a meeting on 28.7.2014 during the Indo-German Representative expert on *'Access and Benefit Sharing (ABS) Mechanism'* held at NRC, Dehradun.

Attended the lecture in Hindi Rajbhasa workshop, delivered by the Rajbhasa Adhikari, Central *Soil* and Water *Conservation* Research and Training Institute.

Attended the celebration of Himalayan Day on 09.09.2014 at BSI, NRC, Dehradun.

Attended Hindi Saptha on 13.09.2014 to 19.09.2014.

Dr. J. S. Jalal

Presented one paper titled *"Regional Conservation Assessment and Prioritization of Endemic Orchid species of Western Ghats in Conservation Zones in Maharashtra"* in the National Conference on Orchids Science and Commerce, at Shri Mata Vaishno Devi University, Kakryal, Katra (J & K) organized by TOSI. Delivered one invited guest lecture on *"Medicinal Plants of Maharashtra"* on 20th Sept. 2014 at Department of Botany, B.N.Bandodkar College of Science, Thane.

Dr. S. K. Das Das

Attended seminar on "National Dialogue on Plant Taxonomy and Conservation' on the occasion of 125th Anniversary of Botanical Survey of India, at Ashutosh Birth Centenary Hall, Indian Museum, Kolkata on 13th& 14th February, 2015.

Dr. Rasmi Dubey

Attended 37th Indian Botanical conference on theme "Biodiversity and Climate change" held in V.G. Vaze College, Mumbai during 7th – 9thNov. 2014., which provided some worthy ideas on effect of Climate on lifespan of microbial population.

Attended two days "National Hindi Scientific Workshop" held in Indian Institute of Tropical Meteorology, Pune on 30- 31st July, 2014.

Attended a workshop on *"Molecular Biology/ Genetic Engineering application"* held at National Chemical Laboratory, Pune from 5th to 7th August, 2014.

Dr. A. Beniamin

Attended 37th Indian Botanical conference (IBC) on theme "Biodiversity and Climate change" held in V.G. Vaze College, Mumbai during 7th -9thNov. 2014.

Attended National Conference on "Modern Approaches to Pteridophytes: Biology, Biodiversity, Bioresource", organized at CSIR- Institute of Himalayan Bioresource Technology, Palampur, Himachal Pradesh during 20-21 December, 2014 and presented paper on *"Taxonomic Study of family Aspidiaceae in North East India"*.

Attended National Seminar on "Science Led Development and Environment Sustainability", 21-22nd February, 2015 held at INSA, New Delhi and presented a paper on *"Ecology and Distribution of Pteridophytes in Western Ghats, India"*.

Dr. A. N. Shukla & Dr. Brijesh Kumar

Displayed and presented photographs in Photo Gallery showing various aspects of Phyto and Habitat diversity in Western Himalaya on International Mountain Day (11 December, 2014) at Mo EFCC, New Delhi, organized by National Museum of Natural History.

Dr. Giriraj Singh Panwar

Attended and delivered an invited lecture in a National Seminar/workshop on "Current and Future Scenario of Plant Tissue Culture, Genomics & Bioinformatics" organized by Division of Life Science, Shri Guru Ram Rai Institute of Technology & Science, Dehradun on 28th & 29th November, 2014.

Delivered a lecture entitled "*Micropropagation of threatened plants of North-West Himalaya*" in 125th birth anniversary programme "National Dialogue on Plant Taxonomy and Conservation" on 13.02.2015 at BSI, NRC-Dehradun.

Dr. Vineet Kumar Rawat

Attended three days Seminar cum Workshop on Modern techniques w.e.f. 13th to 15th March 2013 held at S. K. Jain Institute of Ethno botanical Research with Jiwaji University, Gwalior (M. P.).

Attended One Hindi Gahan Prashikshan Training for 5 days at KendriyaPrashikshanSanksthan, Dept. of Ministry of Home affairs, New Delhi w.e.f 07/07/14-12/07/14.

Attended two days National Conference on Modern Approaches to Pteridophytes: Biology, Biodiversity and Bio resources at IHBT, Palampur w.e.f. 20th to 21st December 2014.

Mr. G. Gnanasekaran

Participated in MOLECULAR PHYLOGENY WORKSHOP (July 18th – 19th, 2014) – Organized by SRM University & IAAT at Dept. of Genetic Engineering, SRM University, Chennai.

Imparted a Herbarium Methodology Training Programme, conducted in BSI, SRC, CBE from 26th May-06th June, 2014.

Attended and displayed 225 potted plants (ornamental, ferns, medicinal, cacti, peperomia, orchids, *Begonias* etc) in 39th Annual Summer flower show, Yercaud on 7th June-8th June, 2014.

Attended Plant exhibition, conducted on 13.02.2015 for 125th Birth Anniversary of BSI at SRC, Coimbatore.

Dr. K. Althaf Ahamed Kabeer

Attended Consultative workshop on "*Participatory Biodiversity Conservation in KMTR: Lessons Learnt and the Way Forward*" *from* Dec. *18 - 20, 2014, at Tirunelveli*, Tamil Nadu.

Participated in the forest meeting held at State forest campus, Coimbatore.

Conducted a National workshop on alien species removal and reclamation of sholas and grass lands in Nilgiri and other parts of Western Ghats of Tamil Nadu.

Imparted training to five scientists of RRC, Ministry of Ayush, on Herbarium Digitization.

Attended season winter flower show at Yercaud on 26th-28th December, 2014.

Dr. M. Gangopadhyay

BSI, SHRC, Organized 6th Meeting of Research Advisory & Monitoring Committee for Botanical Survey of India held at SHRC, Gangtok on 10th and 11th May 2014.

Attended the meeting of Institute Ethical Committee at ARRI, Gangtok as a member, on 05.09.2014.

Dr. D. K. Agrawala

Delivered an invited expert in 13th Institute Research Committee meeting of NRC Orchids, ICAR, Pakyong. On 01.09.2014.

Attended workshop as resource person on "*Conservation Assessment and Management Prioritization*" organized by the State Medicinal Plant Board, Sikkim at Deorali during 11th -12th Sept. 2014.

Delivered invited lecture on "*Red listing of Indian Orchids as per IUCN Criteria*" in workshop on "Vistas in Plant Biology" organized by Botany Department, Sikkim University on 22.09.2014.

Invited speaker in Inauguration and closing of Vigilance Awareness Week celebration at ARRI, Gangtok.

Attended as expert in National Consultation cum Write-shop on "Kangchendzonga Landscape conservation and Development Initiative" organized by GBPIHD, Sikkim unit during 03.12.2014 – 04.12.2014.

Attended as expert in Tribal Health Care Programme of ARRI, Gangtok at Kabi on 27.11.2014.

Dr. Pratibha Gupta

Attended a Seminar on "Excitement in Taxonomy and Ethno-botany for Young Researchers" held on 19th June, 2014 at Asutosh Birth Centenary Hall, Indian Museum, Kolkata.

Attended in Expert Meet and Conference on "Climate Change and Environmental sustainability: Records from Poles to Tropics" held from 9th to 10th Sep., 2014 at University of Lucknow.

Attended a seminar on 'Threats to Biodiversity and Ecosystems: Impacts of Developmental Projects and Climate Change' held from November 17th to 19th, 2014 at Gurukul Kangari University, Haridwar.

Attended Programme as Guest of Honour i.e. Observance of World Environment Day held on 24th June, 2014 on the theme of this year WED i.e. "Small Islands and Climate Change" at CESC, Plant Training Centre, Garden Reach Road, Kolkata.

Awarded Environmental Science Gold Medal with Citation and Memento for "Outstanding Research & Academic Contribution in the Field of Environmental Sciences" on 17.11.2014 during National Seminar on 'Threats to Biodiversity and Ecosystems: Impacts of Developmental Projects and Climate Change' organised by Department of Zoology & Environmental Science, GurukulKangri University, Haridwar.

Dr. S. L. Gupta

Attended RCM and HOO meeting at BSI, SRC, Coimbatore on 19th & 20th May, 2014.

Dr. G. P. Sinha

Attended RCM and HOO meeting at BSI, SRC, Coimbatore on 19th & 20th May, 2014.

Attended TOLIC meeting at Income Tax office, Allahabad on 27.08.2014.

Attended a meeting of Central Government Employees Welfare coordination committee on 03.12.14 at A.G. Office, Allahabad.

Attended HOO meeting and RCM at Howrah on 22.12.14 and 23.12.14 respectively.

Dr. G. P. Sinha & Dr. Arti Garg, Siljo Josef

Attended Departmental Assessment Committee (external) meeting for interview for in-situ promotion to next higher grade Under FCS on 14.01.2015 at MoEF & CC, New Delhi.

Attended a workshop on Capacity Building Training Course in Plant Taxonomy at T.N.B. College, Bhagalpur on 26.02.2015 and 23.02.2015 and delivered lectures cum practical session training to trainees on the topic 'Collection, Preservation and Identification of Lichens' and "Palynology – Its application in stemming the dichotomy between Classical and Molecular Taxonomy" respectively.

Dr. G. P. Sinha & Vineet Kr. Singh

Attended a National Seminar on Science and Technology for Human Development organized by Allahabad University under the banner of Indian Science Congress Association, Allahabad Chapter on 13-14th March, 2015.

Dr. B. K. Sinha & Mrs. Sudeshna Datta

Organized and Participated the seminar "Excitements in Plant Taxonomy and Ethnobotany for Young Researchers" on 19th June.

Organized and attended exhibition & seminar celebrating 125 years of Botanical Survey of India.

Attended environmental awareness fair at Barasat from 14 – 19 January, 2015 to generate awareness regarding botanical wealth.

Dr. A. K. Sahoo

Participated in a workshop on Preservation of artifact and museum materials, organized by NML, Tatanagar (October 13-17, 2014).

Participated as an invitee in the inaugural session of Seminars on Systematic & Taxonomy of Vascular plants held at Calcutta Univ. (Botany dept.) on July 14, 2014.

Participated as an invitee in the foundation day of GSI held at ABC Hall, Indian Museum, Kolkata on March 4, 2015.

Felicitated with "Dr. S. K. Jain award -2014" on Ethnobotany by the Society of Ethnobotanists (on June 19,2014).

Editorial Committee member nominated (2014-17) : Journal "ETHNOBOTANY" by the Society of Ethnobotanists, Lucknow (in July, 2014).

Advisory Committee member nominated: "Centre for Simlipal studies" of North Orissa University, Baripada (in March, 2015).

Evaluation Committee member (Ph.D.Thesis) nominated: Ranchi university (Botany department), Ranchi (in January, 2015).

Arrangement were made with technical facilitation for the Seminar on "National Dialogue on Plant Taxonomy and Conservation" at ABC Hall, Indian Museum, Kolkata on the occasion of 125th Anniversary of BSI during February 13-14, 2015.

Arrangement made for a Seminar on "Excitement on Taxonomy & Ethnobotany of young researchers & Award winner ceremony " at ABC Hall, Indian Museum, Kolkata during June, 2014.

Arumugam S, Bishnu Charan Dey, D. L. Shirodkar

Participated in a workshop on Preservation of artifact and museum materials, organized by NML, Tatanagar (October 13-17, 2014).

Attended environmental awareness fair at Barasat from 14 – 19 January, 2015; to generate awareness regarding botanical wealth.

Arrangement were made with technical facilitation for the Seminar on "National Dialogue on Plant Taxonomy and Conservation" at ABC Hall, Indian Museum, Kolkata on the occasion of 125th Anniversary of BSI during February 13-14, 2015.

Arrangement made for a Seminar on "Excitement on Taxonomy & Ethnobotany of young researchers & Award

winner ceremony " at ABC Hall, Indian Museum, Kolkata during June, 2014.

Arrangement made for a Special Lecture programme by Dr.Vinita Damodaran (UK) in collaboration with Indian Museum, Kolkata during November, 2014

Mrs. Geeta Chaudhury

Participated and organized the seminar "Excitements in Plant Taxonomy and Ethnobotany for Young Researchers" on 19th June.

Organized and attended exhibition & seminar celebrating 125 years of Botanical Survey of India.

Dr. R. K. Gupta

Delivered a plenary lecturer on 'Thermo-tolerant cyanobacteria in various temperature gradients from the thermal spring of Dumka district, Jharkhand, India in a seminar organized on International Biodiversity Day at Central National Herbarium, BSI, Howrah.

Attended & delivered plenary lecture on the topic "Diversity of Euglenophyceae in India" in Technical session of the National Conference on *Progress in Algology in the Indian Context* held at Thiruchirapalli, Tamil Nadu jointly organized by Department of Microbiology, Bharathidasan University Thiruchirapalli, and Krishnamurthy Institute of Algology (KIA) Chennai w.e.f. 19th - 21st September, 2014.

Attended the National Dialogue on Plant Taxonomy & Conservation and inauguration of exhibition on the occasion of 125th Anniversary of BSI in collaboration with Indian Museum, Kolkata.

Delivered a plenary lecturer on Diversity on Euglenophyceae in India in National Conference on Progress in Algology in the Indian Context organised by Dept. of Microbiology,

Attended the National workshop on capacity building training course in plant taxonomy w.e.f. 22nd to 26th Feb. 2015 organized by post graduate centre for studies & research in botany TNB college, Bhagalpur & University Department of Botany, T.M. Bhagalpur University, Bhagalpur in collaboration with BSI & ENVIS centres. A lecture given on the topic "Collection, Preservation and Identification of Algae" on 24th Feb. I have also collected the algal sample in the stagnant water bodies in the University campus and demonstrated 2 genera (*Spirogyra* and *Oedogonium*) in practical session on the same day.

Attended the meeting of the steering committee on All India Coordinated Project on Taxonomy (AICOPTAX) held on 28 Nov. 2014 in Godavari Conference Hall of Indira Paryavaran MoEF & CC, New Delhi and presented 10 project proposals in agenda.

Dr. Kanad Das

Being invited by the Slovak Academy of Sciences, Bratislava, Slovakia a tour was undertaken to Slovakia w.e.f. 06.09.2014 to 17.09.2014 to participate in the International Russulales Workshop 2014 being held from 8–13 September, 2014 at Areál Zdravia, Jedľ ové Kosto ľ any, Slovakia.

Delivered a talk on Exploration, collection, characterization and identification of wild mushrooms with emphasis on a recent attempt in Slovakia in National Seminar on Cryptogamic Botany 2014; amazing cryptogams: learning to know on 19 Dec., 2014, at University of Kalyani, Kalyani.

Delivered a talk on Collection, Preservation and Identification of Macrofungi in the National Workshop on Capacity Building Training Course in Plant Taxonomy on 26th Feb., 2015 at T.N.B. College, Bhagalpur.

Delivered a talk on "Diversity of Macrofungi in Himalaya" in a celebration-programme on International Biodiversity Day being held on 22nd May, 2014 at Central National Herbarium, Howrah.

D. K. Singh & Devendra Singh

Attended a National workshop on 'Capacity Building Training Course' in Plant Taxonomy organized by T.N.B College, Bhagalpur & University Department of Botany, T.M. Bhagalpur University, Bhagalpur – 812 007 in collaboration with Botanical Survey of India MoEF & CC, Govt. of India & ENVIS Centre on Floral Diversity, BSI, MoEF & CC, Govt. of India, Howrah and delivered a lecture on 'Collection, preservation and identification of liverwort and hornwort' on 24.02.2015.

Attended a conference on "Excitements in Taxonomy & Ethanobotany for Young Researchers" organized by Botanical Survey of India at ISIM on 19.06.2014.

Attended a conference on "National Dialogue on Plant Taxonomy & Conservation" on the occasion of 125th anniversary of BSI in collaboration with Indian Museum, Kolkata on 13 and 14 February 2015.

Delivered a lecture on 'Diversity of liverwort and hornwort of Sikkim' on the International Day of Biological Diversity at Central National Herbarium, Howrah.

Manoj Emanuel Hembrom & Arvind Parihar

Attended National Seminar on Cyptogamic Botany : Learning to Know at Kalyani University on 18 & 19 Dec 2014 and deliver an Oral Presentation on "Preliminary macrofungi of Rajmahal hills, Jharkhand.

Attended two days seminar on "National Dialogue on Plant Taxonomy and Conservation" held at ISIM Kolkata on 13th & 14th February 2015.

Oral Presentation on "Preliminary macrofungi of Rajmahal hills, Jharkhand" Department of Botany, University of Kalyani, West Bengal

Awards & Honour

1. Dr.Vineet Kumar Rawat, Sci – 'C' received S. S. BIR Gold medal in Pteridology from Indian Fern society, Chandigarh.

2. Dr. A. Benniamin, Scientist 'D' Received Prof. S.S.Bir Gold Medal Award for the Excellence of Pteridophytes for the year 2014 during the National Conference on "Modern Approaches to Pteridophytes: Biology, Biodiversity, Bioresource", organized at CSIR- Institute of Himalayan Bioresource Technology, Palampur, Himanchal Pradesh during 20-21 December, 2014.

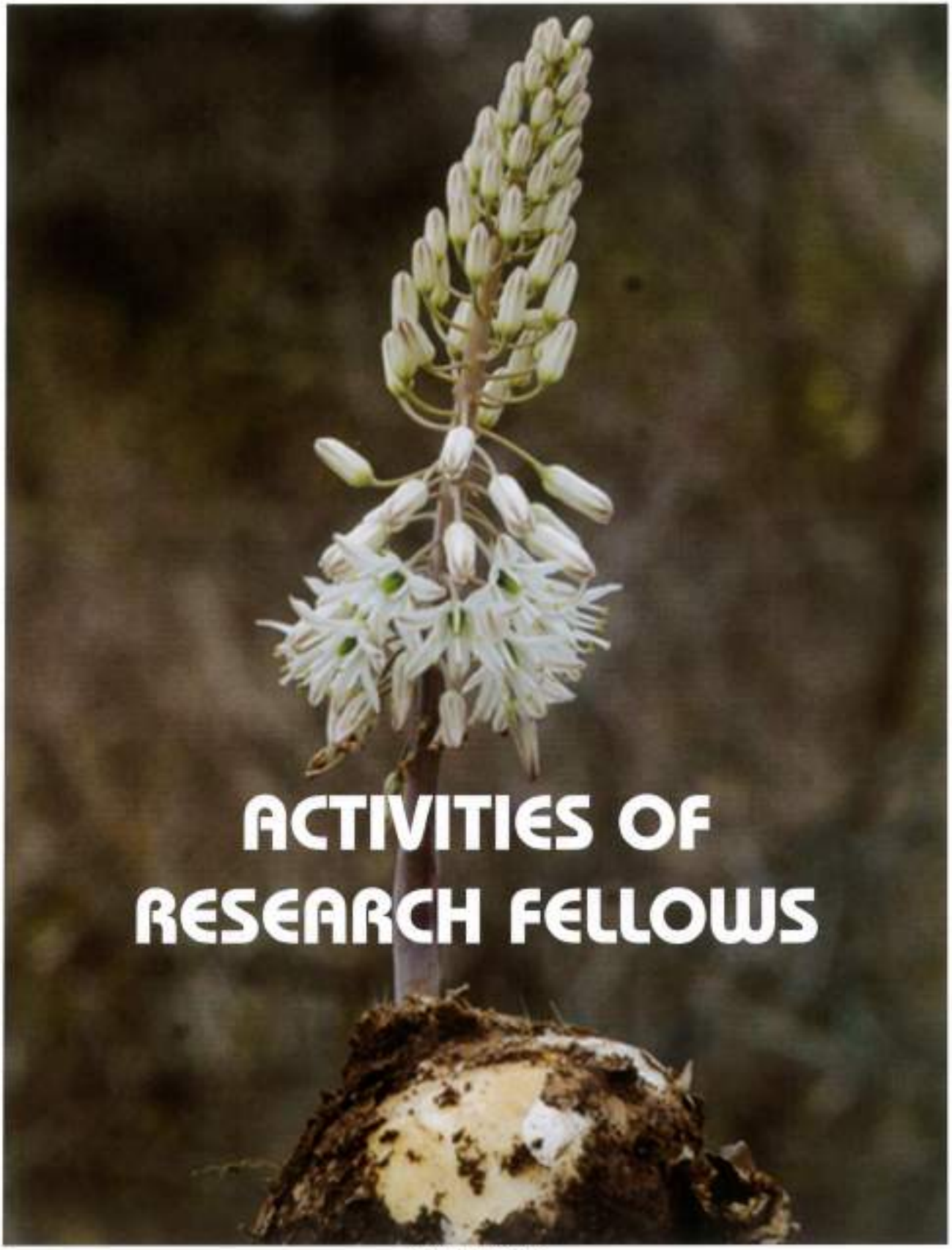
3. Mr. DevandraTripati, JRF, received first prize for the poster presentation during National Conference on "*Modern Approaches to Pteridophytes: Biology, Biodiversity, Bioresource*", organized at CSIR- Institute of Himalayan Bioresource Technology, Palampur, Himachal Pradesh during 20-21 December, 2014.

4. Dr. Harish Singh, Scientist-'C', CBL, Howrah awarded by J.W. Harshberger medal to for 29 years long and distinguished services, research and promotion of Ethnobotany by the Society of Ethnobotanists (SEB) for the year 2013.

5. Dr B.K. Sinha, Dr T.K. Paul, Dr C. Deori, Dr H. Singh, Dr S.S. Dash, Dr A.K. Sahoo from BSI & Dr A. Ekka from Raipur honored with Association of Plant Taxonomy (APT) 2014 award at seminar entitled "Excitements in Taxonomy & Ethnobotany for Young Researchers" in ISIM at Ashutosh Centenary Hall of Indian Museum, Kolkata onJune 19, 2014

6. Dr.Pratibha Gupta, Scientist Awarded Environmental Science Gold Medal with Citation and Memento for "Outstanding Research & Academic Contribution in the Field of Environmental Sciences" on 17.11.2014 during National Seminar on 'Threats to Biodiversity and Ecosystems: Impacts of Developmental Projects and Climate Change' organised by Department of Zoology & Environmental Science, GurukulKangri University, Haridwar.

Medal Awardee during the seminar
"Excitements in Taxonomy & Ethnobotnay" for young researhers on 19 June 2014



ACTIVITIES OF RESEARCH FELLOWS

Drimia nagarjunae

Progress Report of JRF:

1. **Revision of the subtribe Tripogoninae (Poaceae) in India by Dr. Sangita DasChowdhury, AJC Bose PDF:**

   One field tour (September-October 2014) was conducted to southern Western Ghats (Nilgiri Hills), Eastern Ghats (Tirumala hills and Seshachalam Reserve Forest) and arid regions of Telengana (Andhra Pradesh) during which 08 species belonging to *Tripogon*, *Melanocenchris*, *Oropetium* and *Eragrostiella* were collected. About 810 herbarium specimens were studied during consultation of CAL, MH, BSID, BSD and DD among which identity of 445 specimens were checked/ corrected. Data entry of 345 herbarium sheets (at CAL) belonging to genera *Melanocenchris*, *Oropetium* and *Eragrostiella* were completed. This study reported one species *Tripogon mahendragiriensis* Chorghe, Sangita Dey, K.Prasad, Prasanna & Y.V.Rao as new to science. 05 research papers were published in peer reviewed journal. During this period, served as resource person at "National level Capacity Building Training Course in Plant Taxonomy" organized by T.N.B. College Bhagalpur in association with Dept of Botany, Bhagalpur University and BSI during 20-27th Feb, 2015.

2. **Taxonomic diversity and ecology of cyanobacteria and algae in the alpine regions of Eastern Himalayas by Dr. Sudipta Kr. Das, AJC Bose PDF:**

   Conducted one field tour w.e.f. 31st August to 11th September, 2014 in East and North Sikkim districts of Sikkim covering several habitats between 970 – 5231 meter altitudes and a total of 107 specimens were collected of which 165 algal species were identified belonging to 83 genera (20 taxa of Cyanophyta under 14 genera, 01 taxon of Glaucophyta under 01 genus, 43 taxa of Chlorophyta under 18 genera, 04 taxa of Euglenophyta under 03 genera, 92 taxa of Bacillariophyta under 43 genera, 04 taxa of Xanthophyta under 03 genera and 01 species of Dinophyta under 01 genus). One new species i.e. *Johannesbaptistia desikacharyi* Raj.K. Gupta & S.K. Das (Cyanophyceae) was documented from Jamtara, Jharkhand. Two coccal cyanobacterial taxa of the genus *Chamaesiphon* (C. amethystinus (Rostaf.) Lemmerm. and *C. polonicus* (Rostaf.) Hansg. were recorded from Arunachal Pradesh as new records from India. *Prasiolopsis ramosa* Vischer was recorded from Sikkim as new distributional record from Asia. During the period, 03 research papers (01 International + 02 National) were published alongwith publication of 03 popular hindi articles. Participated and presented the research findings in National conference on "Progress in Algology in the Indian Context", held at Department of Microbiology, Bharthidasan University, Tiruchirapalli, Tamil Nadu, w.e.f. 19th September, 2014 to 21st September, 2014; given a talk entitled, "Diversity of freshwater algae in Eastern regions of India" in a Seminar conducted on International Day for Biological Diversity, organized by Botanical Survey of India at Central National Herbarium, Howrah, on 22nd May, 2014.

3. **Taxonomic Revision of Liverwort Genus *Drepanolejeunea* (Spruce) Schiffn. in India by Dr. Monalisa Dey, AJC Bose PDF:**

   During this period, 12 specimens of *Drepanolejeunea* were studied, identified and described, 12 specimens were obtained on loan for study from BM, G and HIRO, 89 specimens were identified into 38 species, SEM studies carried out for 11 species and database of 337 liverworts were prepared. This study reported 05 taxa as new to India. 01 paper published in peer reviewed paper.

4. **Flora of India Project: Revision of the Genus *Festuca* in India by Ms. Sutrishna Kar, SRF & Dr. P. Singh, Scientist-G:**

   One field tour w.e.f. 23.08.2014-03.09.2014 was conducted to Ladakh and different parts of Himachal Pradesh. 23 herbarium specimens were worked out along with dissection, identification, illustration and description. 02 research published in peer reviewed journals.

5. **Floristic study of Liverworts and Hornworts of Arunachal Pradesh with special reference to West Siang District by Siddartha Singh Deo, SPF & Dr. D.K. Singh, Scientist-F:**

   During this period, 151 specimens were identified from unidentified gatherings of which 18 species were described and illustrated. 04 research articles were published in peer reviewed journal.

6. **Revision of the tribe Vernonieae Cass. (Asteraceae) in India by Mrs. Bandana Bhattacharjee, SRF & Dr. P. Lakshminarasimhan, Scientist-D:**

   02 field tours w.e.f. 27.05.14-13.06.14 and 28.10.14-06.11.14 were conducted to Sikkim, North Bengal and Tiruchirappally during which 04 taxa (*Cyanthillium cinereum* (L.) H. Rob. var. *parviflorum* (Reinw.) Karthik. & Moorthy, *Ethulia conyzoides* L. f., *Vernonia aspera* Buch.-Ham. and *Vernonia saligna* DC.) were collected. During this period, dissection of floral parts of 16 taxa was carried out along with SEM studies of pollen of 07 taxa and SEM studies of style branches of 02 taxa. A taxonomic account was prepared for the genera *Elephantopus* L., *Centratherum* Cass. and

Lamaprachaenium Benth. Data entry of c. 300 specimens of Asteraceae was done at CAL along with indexing of 38 genera of Asteraceae, proper arrangement of 5 genera (including their infageneric taxa) and changing of Genus and species cover wherever necessary. During this period, attended two conferences and achieved **S.R. Yadav Award 2014** for the best poster presentation in the **24th Annual Conference of Indian Association for Angiosperm Taxonomy (IAAT) and International Conference on Trends in Plant Systematics (ICTIPS)** .

7. **Revision of the family Memecylaceae DC. in India by Moumita Das Das, SRF & Dr. Arabinda Pramanik, Scientist-D:**

During this period, 02 field tours w.e.f. 10.03.14-21.03.14 and 20.04.14-24.04.14 were conducted to Andaman & Nicobar Islands and South India respectively. Enumerated 02 genera, *Memecylon* and *Mouriri* including a total no. of 53 species and 6 varieties, taxonomy of all the taxa occurring in India was standardised in respect of nomenclature, typification, description, distribution, critical notes (wherever required), specimen examined lists, etc. Taxonomy of all the taxa occurring in India standardised in respect of nomenclature, typification, description, distribution, critical notes (wherever required), specimen examined lists, etc. A key to the genera and infra generic taxa was also prepared. Illustration prepared and photographs provided for the taxa of Memecylaceae as found growing in India. SEM images taken for seeds, pollens and leaves of available taxa. This study reported 01 species and 01 variety of *Memecylon* as new to science, 02 varieties as new in Indian distribution, 02 new combinations in nomenclature proposed, 01 new combination and 01 new status for a species proposed; reinstated distinct species status in one taxon. During this period, published 03 papers in peer reviewed journal and attended attended IAAT Conference 2014, held at Bharathidasan University, Tiruchirapally, Tamil Nadu.

8. **Moss Flora of Darjeeling District by Ms. Pamela Saha, SRF & Dr. Md. Nehal Aziz, Scientist-D:**

Completed Line drawings & descriptions of 71 specimens; identified 119 species along with identification of 18 Old herbarium specimen.

9. **Revision on the subgenus *Vignea, Vigneastra* & *Psylophora* of the genus *Carex* L. (Cyperaceae) in India by Bikash Jana, SRF & Dr. V. Sampath Kumar, Scientist-C:**

During this period, 16 species of *Carex* [*C. myosurus* Nees (Manas Bhaumik s.n., ASSAM); *C. alta* Torr. (M. Bhaumik 4162, ARUN); *C. lehmanii* Drejer (G.P.Sinha & D.G.Long & al. 17878); *C. speciosa* ssp. *varmae* Bhaumik & Pathak (Manas Bhaumik 27190, ARUN); *C. rubro-brunnea* C.B. Clarke (M. Bhaumik, 25739, ARUN); *C. remota* var. *rochebrunii* (Franch. & Sav.) C.B. Clarke (M. Bhaumik 25604, ARUN); *Carex sp.* (B.Kishna & S.Singh 3043, SHRC); *C. brunnea* Thunb. (Saujieres 1129,CAL); *C. curaica* Kunth (*Dr. V.N. Kaul* P42, CAL); *C. dimorpholepis* Steud. (*A.C. Chaterjee* s.n., CAL); *C. facata* Boott ex C.B.Clarke; *C. phacota* Spreng. (*C.B. Clarke* 35636, CAL); *C. praelonga* C.B. Clarke (*C.B. Clarke* 27879 A, CAL); *C. remota* L. (*C.B. Clarke* 43689, CAL); *C. teres* Boott (*Manas Bhaumik* 13260, CAL); *C. teinogyna* Boott (*C.B. Clarke* 45910, CAL) were dissected along with preparation of illustrations. Nut surface of 09 taxa of *Carex* were prepared for SEM study. All the specimens, previously collected from Arunachal Pradesh, Meghalaya and Sikkim were poisoned and mounted. About 600 specimens of the following genera (*Oryza, Pennisetum, Triticum, Sorghum, Avena, Panicum, Eleusine, Zea, Saccharum, Hordeum, Cymbopogon, Vetiveria, Aristida, Thysanolena, Arundo, Coix, Apluda, Halopyrum, Phragmites, Imperata, Cynodon, Paspalum, Zoysia*) belonging to the family Poaceae were sorted out for digitization. Attended and presented a paper on the topic " Micromorphological studies on the genus *Kobresia* (Cyperaceae) in India" on a Nationl Seminar on Contemporary Progress in Plant Science" arranged by the University of Burdwan on 20 – 21st March, 2015 and attended a seminar of "National dialogue on plant Taxonomy and Conservation" held at ISIM, BSI on 13th and 14th February, 2015. Arranged, incorporated and sorted out about 200 specimens belongs to the family Orchidaceae in HALL no. 5 at CNH.

10. **Taxonomic Revision of the subgenus *Carex* of genus *Carex* L. (Cyperaceae) in India**

(c. 125 species) by Sri. Animesh Maji, JRF & Dr. V.P.Prasad, Sientist-C:

One field tours w.e.f. 25.08.14-09.09.14 to Nilgiris, Palani Hills, Silent Valley and some other hill stations of Southern western Ghats was carried out during which c. 500 specimens of 169 field no. were collected. Description and illustration of 20 species of *Carex* were prepared. During this period, one herbarium consultation tour was also undertaken to ARUN, SFRI, ASSAM and BSHC during which 414 specimens of *Carex* were studied. This study reported one new species (*Carex kotagirica*) from the Nilgiris. Attended 03 seminar.

11. Revision on the family Myrsinacaee in India by Ms. Rijupalika Roy, JRF & Dr. Arabinda Pramanik, Scientist-D:

Two field tours w.e.f. 11.09.14-21.09.14 and 15.02.15-03.03.15 were conducted to Shillong and its vicinity and Sikkim, Arunachal and its vicinity respectively during which 09 taxa (*Maesa indica, Maesa Montana* A.DC., *Maesa chisia* Don, *Maesa indica* var. *angustifolia* Hook.f. & Thomson, *Maesa macrophylla* (Wall)A.DC., *Maeasa rugosa* Clarke, *Embelia ribes* Burm.f., *Myrsine semiserrata* Wall , *Ardisia virens* Kurz) were collected and consulted the genera *Maesa* : 5 spp., Myrsine : 3 spp., Embelia : 11 spp., Ardisia: 23 spp., *Antistrophe, Aegiceras, Amblyanthus, Pimelandra, Sadiria, Hymenandra, Rapanea*: 1 sp. each. During this period, type materials were recorded from CAL, ASSAM and ARUN, formatted data of 66 species from herbarium sheets, distribution map of 04 genera was prepared, dissection of 18 species were prepared along with illustration and measurement, consulted protologues of 62 species. In addition, as a part of herbarium maintenance work, 102 pegion holes of family Rhamnaceae and 127 pigeon holes of family Sapindaceae (350 species under 48 genera) were rearranged along with entry of 1478 sheets of the families Myrsinaceae and Rhamnaceae. This study reported presence of resin in the cavities or ducts in sepals/ petals/ bracts or in all and presence of monstrous development in the genus *Maesa*.

12. Taxonomic revision of *Pteris* (Pteridaceae) in India by Ms. Piu Das, JRF & Dr. P.M. Padhye, Scientist-E:

During this period, field tours were undertaken to Tamil Nadu (Kodaikanal, Nilgiri hilis), Kerala (Calicut, Wayanad), Maharashtra (Pune, Koyna forest, Mahabaleshwar), Meghalaya (Shilong, Cherrapunji), Assam (Guwahati) in which 74 live plants were collected along with 200 photograph of which 10 species were identified. Description of 25 species were completed along with preparation of illustration of 6 species, 10 photoplates and SEM studies of 15 species of *Pteris* L. Besides, 12 herbaria were consulted for study of 356 herbarium specimens, 24 digital images and 15 type specimens. As special assignment for rearranging specimens in CNH, the specimens of the family **Clusiaceae** deposited in CNH, Hall.no.1 was rearranged according to phytogeographical regions of India. The specimens outside India were also rearranged according to the given format. Rearrangement of specimens in 6 pigeon holes completed and noted down the available data. During this period, one paper was published.

13. Hepaticae and Anthocerotae of Anjaw District, Arunachal Pradesh by Shuvadeep Majumdar, JRF & Dr. D.K.Singh, Scientist-F:

During this period, one herbarium consultation tour w.e.f. 17.11.2014 – 22.11.2014 was conducted to Eastern Regional Centre, BSI, Shillong (ASSAM). 29 species were worked out along with camera lucida drawings, completed description of 20 species along with 34 illustrations and 34 photoplates. Identified and consulted specimens with Prof. T. Pocs(Hungary) and data entried for 120 herbarium specimens. SEM studies was carried out for 05 specimens. Data entried for 120 herbarium specimens. 05 paper published in peer reviewed journal.

14. Studies on the families Agaricaceae, Boletaceae, Hygrophoraceae, Suillaceae and Cantharellaceae of East and South Districts of Sikkim by Dyutiparna Ckakraborty, JRF & Dr. Kanad Das, Scientist-C:

Participated in the macrofungal exploration (undertaken by Dr. Kanad Das and party) w.e.f. 18.07.2014 to10.08.2014 to different parts of Sikkim during which ca 28 field numbers were collected and all the specimens were preserved. Thorough micromorphological characterization and microphotography of the 18 specimens were carried out along with preparation of Complete (macro- and micromorphological) descriptions and drawings of 18 specimens and identified 14 specimens. 01 research papers were published in peer reviewed journal.

15. Ethnobotanical study of Lodha (A primitive tribal Group) of West Bengal and nutraceutical analysis of selected plant species by Ms. Sagari Chaudhury, JRF & Dr. Harish Singh, Scientist-C:

First Ethnobotanical Field tour undertaken to Paschim Medinipur district w.e.f. 23rd June to 27th June 2014 (5days)and Collected specimens: 63; Ethnobotanical uses: 90; Photograph taken: 200. Area surveyed Khejurguti, Parijatpur, Santrapur, Belma Saldanga, Kolmapakuria and nearby forest of Keshiary and Nayagram blocks.

Achievements:

63 nos. of ethnobotanical interested species collected with the help of medicine man (Baidya or elder village people, local Lodha people and Lodha women) from 5 villages of Keshiary and Nayagram Block of Paschim Medinipur district. There are about 90 ethnobotanical uses recorded. Out of 90 uses 48 are as medicinal, 22 food, 2 tooth brush,1 hair treatment, 2 insect repellant, 1 snake repellant, 2 basket making, 1 rope making, and 1fencing and 10 other purposes.

2nd tour **Ethnobotanical Field tour of Paschim Medinipur district from** 27th October to 30th October, 2014 (4 days). *Total Collected specimens: 57; Ethnobotanical uses: 75; Photograph taken: 150* . Forest areas of Sankrail and Narayangardh blocks and a village of Keshiary Block of Paschim Medinipur

Period of the tour:

Achievements:

57 nos. of ethnobotanical interested species collected from 3 blocks namely Sankrail, Narayangardh Block of Paschim Medinipur district. There are about 75 ethnobotanical uses recorded. Out of 75 uses 46 are as medicinal, 13 food, 3 snake, scorpion and dog bite, 1 pesticide, 2 timber yielding,1 rope making, 2 ethno veterinary, 2 land races of paddy and 5 miscellaneous purposes.

Third **Ethnobotanical Field tour of Purulia district: Period of the tour:** 24th December to 31st December, 2014 (8 days). *Total Collected specimens: 30; Ethnobotanical uses: 32; Photograph taken: 80*

Study Site: Villages namely Ghatihuli, Bhupatipalli, Bareriya, Kashipur, nearby forest of Bandwan, Baghmundi, Ajoydhya have been visited and collected plant specimens and ethnobiological information.

Achievements:

30 nos. of ethnobotanical interested species collected with the help of medicine man (Baidya or elder village people, local Lodha people and Lodha women) from Purulia district. There are about 32ethnobotanical uses recorded. Information about the tribal artifacts sold in the market and their selling and costing price was also documented. Ethno zoological information also collected from the Birhor medicine men.

Out of 32 uses 23 are as medicinal, 2 food, 1 snake repellant, 2 basket making, 2 rope making, and 2 other purposes.

150 collected specimens (in duplicate) were poisoned, mounted and stitched.

Identified specimens:

Solena amplexicaulis (Lam.) Gandhi- male plant, *Solena amplexicaulis* (Lam.) Gandhi – female plant, *Coccinia grandis* (L.) Voigt, *Azadirachta indica* A.Juss., *Artocarpus heterophyllus* Lam., *Streblus asper* Lour., *Scoparia dulcis* L., *Amaranthus spinosus* L., *Holarrhena pubescens* Wall. ex G.Don, *Jatropha gossypiifolia* L., *Ipomoea aquatica* Forssk., *Chrysopogon zizanioides* (L.) Roberty, *Eclipta prostrata* (L.) L., *Colocasia esculenta* (L.) Schott, *Amorphophallus sylvaticus* (Roxb.) Kunth, *Abrus precatorius* L., *Aerva lanata* (L.) Juss., *Chrysopogon zizanioides*, *Aristolochia indica* L., *Asparagus racemosus* Willd., *Cassia fistula* L., *Cheilocostus speciosus* (J.Koenig)C.D.Specht, *Cissampelos pareira* L., *Baliospermum solanifolium* (Burm.) Suresh, *Curculigo orchioides* Gaertn, *Desmostachya bipinnata* (L.) Stapf, *Hemidesmus indicus* (L.) R. Br. ex Schult., *Phoenix sylvestris* (L.) Roxb., *Rauvolfia serpentina* (L.) Benth. ex Kurz, *Shorea robusta* Gaertn.

Additionally, Flora consulted: 3, Journal Consulted: 14, Book Consulted: 20 and Thesis Consulted: 2 during the period.

16. Taxonomic Revision of the family Fagaceae in India by Ms. Shankhamala Mitra JRF & Dr. Vinay Ranjan, Scientist-C:

Two field tours w.e.f. 15.09.14 -26.09.14 and 15.2.15 - 26.02.16 to Gangtok and neighbouring areas and Itanagar & ERC, Shillong were conducted during which 1 species of *Castanopsis* (*C. indica*) , 2 species of *Quercus* and 1 species of *Lithocarpus* (*L. dealbatus*) were collected. Completed dissections & descriptions prepared for 10 species, viz. *Lithocarpus spp.* (*L. dealbatus, L. fenestratus, L. polystachyus, L. pachyphyllus*); *Quercus spp.* (*Q. serrata, Q. lamellosa, Q. semecarpifolia,*) and *Castanopsis spp.* (*C. indica, C. tribuloides, C. purpurella*). Consulted 70 herbarium specimens at SFRI, Itanagar, 102 herbarium specimens at ARUN, Itanagar , 1097 herbarium specimens at ASSAM, Shillong and also some herbarium specimens deposited at SHRC, Gangtok. Rearranged 60 pigeon holes belonging to the family Fagaceae and entered the details of 20 herbarium specimens in excel data sheets. Besides, 38 pigeon holes belonging to the family Caprifoliaceae were rearranged and entered the details of 380 herbarium specimens in excel data sheets. As part of herbarium maintenance, assisted in herbarium digitization of the specimens of the following genera belonging to the family Orchidaceae deposited in CNH, Hall No. 5, viz. *Habenaria, Schoenorchis, Saccolabium, Smitinandia, Gastrochilus, Renanthera, Vanda, Papilionanthe, Aerides, Platanthera, Coelogyne, Peristylus, Anacamptis, Serapias, Aceras, Epipactis, Gymnadenia and Dactylorhiza*, family Cucurbitaceae deposited in CNH, Hall No. 3, viz. *Momordica, Benincasa, Thladiantha, Lagenaria, Cucumis, Biswarea, Trochomeria, Abobra, Eureiandra, Luffa, Gymnopetalum, Citrullus, Peponium, Thladiantha, Citrullus, Coccinia, Edgaria, Cucurbita, Bryonia, Melothria, Solena, Diplocyclos, Zehneria, Kedrostis, Corallocarpus, Apodanthera, Sicydium, Cayaponia, Actinostemma, Cyclanthera, Sicyos, Sechium, Microsechium, Sechiopsis, Schizocarpum and Dactyliandra*, specimens (14

pigeon holes) of the genus *Prunus* belonging to the Family Rosaceae deposited in CNH Hall No. 3 and specimens belonging to the family Zygophyllaceae deposited in CNH Hall No. 5.

17. Taxonomic Studies on the genus *Rubus* L. in India by Ms. Chandani Gupta, JRF & Dr. S. S. Dash, Scientist-C:

One field tour was undertaken to North & East districts of Sikkim and collected 96 specimens of *Rubus* belonging to 11 species and also consulted the herbarium (BSHC) of Sikkim Himalayan Regional Centre, BSI and studied about 371 herbarium specimens of *Rubus*. Rearranged and indexed all the herbarium specimens of *Rubus* of India kept in Central National Herbarium (CAL), BSI. Studied about 400 specimens belonging to 10 species of *Rubus* at CAL. Surveyed about 80 literature that includes national, international, state and regional floras, journal articles, revisionary and monographic works. Collected 57 protologue and 68 type specimens of *Rubus*. Carried out SEM of pollen and seed samples of 6 species of *Rubus*. Descriptions and illustrations of 10 species of *Rubus* were prepared along with a brief accounts on distribution and diversity of *Rubus* occurring in eastern Himalaya of India and on the medicinal & economical uses of *Rubus* species. Presented a paper entitled "Distribution and Diversity of Genus *Rubus* L. in Eastern Himalaya, India: A Preliminary Appraisal" at IAAT conference held at Bharathidasan University, Tiruchirappalli, India.

18. Micropropagation and screening of secondary metabolites of six medicinal orchids in Meghalaya by Mrs. Gargi Prasad, JRF, Dr. A.A.Mao, Scientist-F & Dr. Deepu Vijayan :

The following 6 medicinal orchid plants have been taken for the research work and the results are as follows.

Aerides odorata:Multiple shoot induction studies initiated using shoots of *in vitro* raised plantlets on MS nutrient medium containing different concentrations (0.5, 1, 2, and 4) of BA (6-Benzyladenine). Medium devoid of PGR served as a control. Results awaited.

Transferred about 40 plantlets in greenhouse for hardening. Transferred about 30 plantlets to BSI office garden for acclimatization.

Dendrobium chrysotoxum:Continuous subculture of *in vitro raised* plantlets on fresh MS medium containing 10%banana.Transferred about 30 plantlets to green house for hardening. Transferred about 50 plantlets to BSI office garden for acclimatization.

Dendrobium nobile:To standardize optimum medium an experiment was set up on MS nutrient medium containing different additives (control, 0.2% charcoal, 10% banana and 10% coconut water).

Cephalantheropsis gracilis:Shoot induction using nodal portion of young shoots on plain MS nutrient medium. New shoot started to come out.

Malaxis acuminata:Shoot induction using nodal portion of pseudobulbs on plain MS nutrient medium. New shoot attained 0.5cm in height.

Bulbophyllum odoratissimum: Shoot induction using nodal portion of young shoots on plain MS nutrient mediumn.

19. Taxonomic Studies on Lejeuneaceae Schizostipae (Marchantiophyta) in Northeast India including Sikkim by Shashi Kumar, JRF and Dr S.K. Singh, Scientist-C:

Study of Plant Sample & Illustration :- During the period *Leptolejeunea elliptica* (Lehm. & Lindenb.) Schiffn., *Lejeunea eifrigii Mizut. Lejeunea wightii* Lindenb.; *Lejeunea cavifolia* (Ehrh.) Lindb. *Drepanolejeunea herzogii* R.L. Zhu & M.L. So.; *Lejeunea subacuta* Mitt.; *Drepanolejeunea fleischeri* (Steph.) Grolle & R.L. Zhu; *Lejeunea obscura* Mitt.; Cheilolejeunea kitagawae W. Ye & R.L. Zhu; *Lejeunea minutiloba* A. Evans eight Species were identified described and illustration prepared.

20. Revisionary studies on family *Pertusariaceae* (Lichens) by Shri Sashikant Gupta, J.R.F/ S.R.F. and Dr. K.P. Singh, Emeritus Scientist:

Identified **87** specimens of *Pertusariaceae* into following species. Besides, following Kerala specimens viz. LWG 72.277, 73.703, 85.216; Sikkim: BSHC 377; West Bengal: LWU 3113; Tamil Nadu: LWG 2021554, 02.10148 (LWG); L65104 (LWG), Himachal Pradesh 05.005422 (LWG), L104668 (LWG) Uttarakhand and BSA 7517, 7528, 7529, 7530, 7532, 7534, 7535, 7537, 7538, 7539, 7540, 7541, 7597 were also studied and identified.

21. Revisionary studies on Tribe *Helianthae* (Family Asteraceae)- [2011-2016] by Sri Jitendra Kumar Vaishya, SRF & Dr. A.A. Ansari, Retired Scientist-E:

Five herbarium consultation tours were undertaken to different herbaria of India *viz.* NBPGR, New Delhi w.e.f. 06.10.2014 to 14.10.2014; BSI, Itanagar and BSI, Shillong (ASSAM) w.e.f. 25.11.2014 to 05.12.2014; Indian Institute of Science, Bangaluru (JCB) and

Foundation for Revitalisation of Local Health Traditions, Yelehanka, Bangaluru (FRLHT) w.e.f. from 29.12.2014 to 05. 01. 2015; BSI, Northern Regional Centre, Dehradun (BSD) w.e.f. 07.03.2015 to 15. 03.2015 and BSI, Southern Regional Centre (MH) w.e.f. 13.10.2014 to 22.10.2014.

Consulted/ identified/ verified 1289 herbarium specimens belonging to 18 genera of tribe *Heliantheae viz. Galinsoga, Synedrella, Calyptocarpus, Sclerocarpus, Lagascea, Guizotia, Chrysanthellum, Glossocardia, Sigesbeckia, Blainvillea, Bidens, Eclipta, Spilanthes, Tridax, Wedelia, Xanhium, Enydra* and *Acmella*. Taxonomic description of 05 species *viz. Lagascea mollis* Cav., *Synedrella vialis* (Less.) A. Gray, *Flaveria trinervia* (Spreng.) C. Mohr, *Sigesbeckia orientalis* L. & *Chrysanthemum americanum* (L.) Vatke were completed. Collected 16 specimens during consultation tours to different herbaria of India. Completed poisoning, mounting and label writing of 49 specimens. Deposited 108 herbarium specimens with Acc. No. in BSA herbarium. Specimens studied and description completed of : 229 species. Presented a paper entitled "Taxonomic status of tribe Heliantheae – Asteraceae in India" and its medicinal value in the National workshop on traditional healing practices in North East India, Zero Arunachal Pradesh organized by Ayurveda Regional Research Institute, Itanagar, Arunachal Pradesh on 02nd - 3rd December, 2014.

22. Revisionary Studies on Family *Roccellaceae sensu lato* in India (Flora India Project) by : Sri Siljo Joseph, SRF and Dr. G.P. Sinha, Scientist-D:

Two field tours were undertaken to Gujarat along with BSI tour party w.e.f. 25.11.2014 to 12.12.2014 and Kerala w.e.f. 15.03.2015 to 17.04.2015.Completed the detailed morpho-anatomical study and identified following 66 specimens.Received 29 specimens on loan from LWG. Remounted 59 Lichen Type specimens of BSA.

23. Taxonomic studies on lichenised Non Thelotremoid Indian Graphidaceae by Miss. Pushpi Singh, SRF and Dr. K.P. Singh, Ex-Emeritus Scientist:

One field cum study tour was undertaken to Almora w.e.f. 10.3.2015 to 25.03.2015 and 110 Field packets (ca. 250 F. Nos.) were collected. Completed morphological, anatomical, chemical test and TLC study of 148 lichen specimens of *Graphidaceae* collected from Arunachal Pradesh, Andaman & Nicober Island, Nagaland, Meghalaya & West Bengal, loan specimens from ASSAM, CAL and in house specimens (BSA) of which following 102 specimens were identified in to 70 species.

24. Lichens of Terai Region, Uttar Pradesh by Miss Pooja Gupta, JRF and Dr. G.P. Sinha, Scientist-D:

One field tour was undertaken to Pilibhit, U. P. w.e.f. 25.07.2014 to 05.08.2014 and 116 field Nos. of lichen specimens were collected. Completed morphological, anatomical, chemical test and TLC study of 63 lichen specimens of Sikkim, Rajasthan and Uttar Pradesh and were identified into 36 species. Detailed anatomical studies of following 44 specimens were also made: BSA :7767, 7779, 7775, 7784, 7788, 7803, 7805, 7824, 7838, 7844, 7847, 7853, 7913, 7931, 7971, 3616 A, 3616 B, 7869, ,7775, 7775, 7844, 7784, 7971, 8053, 8145, 8152, 8153, 8161, 8174, 8177, 8178, 8185, 8188, 8189, 8194, 8195, 8196, 8640, 8687, 8688, 8689, 8690, 8691, 8695.

Submitted Pd.D. thesis in October 2014 on the topic entitled Lichen flora of Assam to Devi Ahilya Vishwavidyalaya, Indore, Madhya Pradesh under supervision of Prof. C.M. Solanki and G.P. Sinha based on the work done under AICOPTAX Projec, Collaborating unit on lichens at BSI, CRC.

25. Studies on Lichen flora of Kerala by Sri Digvijay Verma, JRF and Dr. K.P. Singh, Ex-Emeritus Scientist:

One field tour was undertaken to Kerala w.e.f. 26.11.2014 to 21.12.2014 and collected 362 Field Nos.of lichen specimens. Completed morphological, anatomical, chemical test and TLC study of 97 lichen specimens of which following 20 were identified in to 16 species.

26. Revisionary studies on family Ophioglossaceae Martinov in India by Dr. Pushpesh Joshi, PDF & Dr. S.K. Srivastava, Scientist-D:

Described in details along with dissection and illustration for *Botrychium virginianum* (L.) Sw. and *Ophioglossum costatum* R. Br., *Botrychium lunaria* (L.) Sw. Authenticated the specimens of *Botrychium lanuginosum* Wall. ex Hook. & Grev. housed at DD Herbarium; Drawn habit of *Botrychium ternatum* (Thunb.) Sw.; Dissected *Botrychium lunaria* (L.) Sw., *Botrychium ternatum* (Thunb) Sw. and *Botrychium lanuginosum* Wall. ex Hook. & Grev; Received specimens on loan from BSI, Jodhpur, BSI, Port Blair, BSI, ERC, Shillong (ASSAM), Central National Herbarium (CAL) and acknowledged; Participated the inaugural function of Raashi Vatika (Zodiac Garden) and *Parthenium* sp. eradication program on occasion of World Environment Day (5 June); A detailed description of 24 taxa along with the correct name, citation and their exicatta were recorded. Bracketed keys for the identification of families, genera and species have been prepared. Compiled half yearly progress

report and sent to head quarter, as directed. **Field tour:** Conducted plant survey and collection tour to Champawat (Chalthi, Swala, Shyamalatal, Lohaghat, Reetha Sahib, Mayawati) and Nainital (Kilbury, Pangote, Naina peak, Jeolikote, Dogaon) from 09.11.2014 to 24.11.2014 and collected 208 field numbers and 384 photographs taken. Herbarium & library consultation **[1]** BSI, Sikkim Himalayan Regional Centre, Herbarium, [BSHC] Gangtok *w.e.f.* 18th - 26th Aug. 2014. Total number of herbarium specimen studied- 29; Identity of total number of specimen reconfirmed- 17 Total number of determinavit slip pasted- 12; Reference collected from library- 5; **[2]** Conducted herbarium consultation tour to D.S.B. Campus, Kumaon University, Nainital and examined 33 herbarium specimens; 24 reconfirmed; 9 *determinavit*/identified. **[3]** Indraprastha College, New Delhi. Outcomes are as follows: Specimens examined: 10; Reference collected : 5; Consulted Literature on family Ophioglossaceae in India and outside; Consulted BSD & DD herbarium. Assisted Dr. Brijesh Kumar in returning the loan specimens of Mr. Himanshu Dwivedi to ARUN, BSA and MH (Total 33 Sheets). Pteridophyte and Gymnospern specimens of cold desert (Lahul-Spiti & Laddakh) were sorted out; Attended a lecture on Himalayan day on 9th September, 2014 at BSI, NRC. Attended and participated Hindi week on 12th-19th September, 2014. Attended and participated in Clean India Mission on 2nd October, 2014. Attended the PG students of Pt. L.M.S.P.G. College, Rishikesh and provide information about Fern house, BSI (NRC), Dehradun. Attended and participated in 125th anniversary celebration of BSI. Assisted Mr. Harish Chand Anand, asstt. Prof., H.P. University Shimla in identification of 2 specimens collected from Lahaul, HP.

27. Revision of subtribe Habenarinae by Lav Kush, SRF & Dr. H.J. Chowdhery, Emeritus Scientist:

Described 29 species viz., 1. *Peristylus affinis* (D.Don) Seidenf., 2. *Peristylus aristatus* Lindl., 3. *Peristylus balakrishnanii* Karthig., Sumathi & Jayanthi, 4. *Peristylus brachypyhllus* A.Rich. 5. *Peristylus cubitalis* (L.) Kraenzl, 6. *P. densus* (Lindl.) Santapau & Kapadia, 7. *P. duthiei* (Hook.f.) Deva & H.B. Naithani, 8. *P. elisabethae* (Duthie) R.K.Gupta, 9. *P. fallax* Lindl, 10. *Peristylus goodyeroides* (D.Don) Lindl., 11. *Peristylus gracilis* Blume, 12. *Peristylus hamiltonianus* (Lindl.) Lindl., 13. *Peristylus kumaonensis* Renz, 14. *Peristylus lacertifer* (Lindl.) J.J.Sm., 15. *Peristylus lancifolius* A.Rich, 16. *Peristylus lawii* Wight, Icon., 17. *Peristylus mannii* (Rchb.f.) Mukerjee, 18. *Peristylus monticola* (Ridl.) Seidenf., 19. *Peristylus nematocaulon* (Hook.f.) Banerji & Pradhan, 20. *Peristylus parishii* Rchb.f., 21. *Peristylus plantagineus* (Lindl.) Lindl., 22. *Peristylus prainii* (Hook.f.) Kraenzl., 23. *Peristylus spiralis* A. Rich, 24. *P. superanthus* J.J. Wood, 25. *P. tipuliferus* (E.C. Parish & Rchb.f.) Mukerjee, 26. *Peristylus pseudophrys* (King & Pantl.) Kraenzl., 27. *Peristylus* richardianus Wight, 28. *Peristylus sahanii* Kumar, G.S. Rawat & Jalal, 29. *Peristylus secundus* (Lindl.) Rathakr; Procured Type specimens and protologues of above species; Prepared photoshop plate of 7 species viz., 1. *Pecteilis triflora* (D. Don) T. Tang & F. T. Wang, 2. *Peristylus elisabethai* (Duthai) R.K.Gupta, 3. *Peristylus fallax* Lindl., 4. *Satyrium nepalense* D.Don, 5. *Peristylus nematocaulon* (Hook.f.) Banerji & Pradhan, 6. *Diphylax urceolata* (C.B. Clarke) Hook. f., 7. *Androcorys josephi* (Rchb.f.) Agrawala & H.J.Chowdhery;

Prepare distribution map for 19 species viz., 1. *Diplomeris hirsute* (Lindl.) Lindl. 2. *Diplomeris josephi* A.N.Rao & Swamin., 3. *Diplomeris pulchella* D. Don, Prodr., 4. *Androcorys angustilabris* (King & Pantl.) Agrawala & H.J. Chowdhery, 5. *Androcorys gracilis* (King & Pantl.) Schltr., 6. *Androcorys josephi* (Rchb.f.) Agrawala & H.J. Chowdhery, 7. *Androcorys kalimpongensis* (Pradhan) Agrawala & H.J. Chowdhery, 8. *Androcorys monophylla* (D.Don) Agrawala & H.J. Chowdhery, 9. *Androcorys pugioniformis* (Lindl. ex Hook. f.) K.Y.Lang, 10. *Pecteilis gigantea* (Sm.) Raf., 11. *Pecteilis henryi* Schltr., 12. *Pecteilis susannae* (L.) Raf., 13. *Pecteilis triflora* (D.Don) Tang & F.T.Wang, 14. *Peristylus affinis* (D.Don) Seidenf., 15. *Peristylus aristatus* Lindl., 16. *Peristylus brachypyhllus* A. Rich., 17. *Peristylus cubitalis* (L.) Kraenzl., 18. *Peristylus densus* (Lindl.) Santapau & Kapadia, 19. *Peristylus duthiei* (Hook.f.) Deva & H.B.Naithani; Digitised 40 specimens of Orchid.

Conducted field tour to Pithoragarh w.e.f. 9-18 Aug. 2014, for Orchid collection and collected 25 field No. of 15 species viz., 1. *Bulbophyllum* sp., 2. *Dendrobium bicameratum* Lindl., 3. *Eria spicata* (D.Don) Hand.-Mazz., 4. *Herminium lanceum* (Thunb.ex Sw.) Vuijak, 5. *Liparis deflexa* Hook.f., 6. *Liparis rostrata* Rchb.f., 7. *Malaxis accuminata* D.Don, 8. *Malaxis cylindrostachya* (Lindl.) Kuntze, 9. *Ornithochilus difformis* (Wall. ex. Lindl.) Schltr., 10. *Peristylus elisabethai* (Duthai)R.K.Gupta, 11. *Peristylus fallax* Lindl., 12. *Pholidota embricata* (Roxb.)Lindl., 13. *Platanthera clavigera* Lindl., 14. *Satyrium nepalense* D.Don, 15. *Spirenthes sinensis* (Pers.) Ames.

Introduced four Orchid specimens in the Orchiderium; Studied type specimen of *Peristylus spiralis* A. Rich;

Peristylus superanthus J.J. Wood, *Peristylus tipuliferus* (E.C.Parish & Rchb.f.) Mukerjee.;

Wrote critical notes about five species viz., 1. *Androcorys josephi* (Rchb.f.) Agrawala & H.J. Chowdhery, 2. *Androcorys kalimpongensis* (Pradhan) Agrawala & H.J.Chowdhery, 3. *Androcorys monophylla* (D.Don) Agrawala & H.J.Chowdhery, 4. *Androcorys angustilabris* (King & Pantl.) Agrawala & H.J.Chowdhery, 5. *Androcorys gracilis* (King & Pantl.) Schltr; Prepared the chapter endemism for sub tribe Habenariine (Except the genus *Habenaria* Willd.); Consulted library for literatures and BSD & DD herbarium.

28. Revision of the genus *Athyrium* Roth in India by Himanshu Dwivedi, SRF & Dr. S.K. Srivastava, Scientist ¯ D:

No. of type specimens studied: 14
No. of species described: 11
No. of species for prepared photo plate: 15
No. of species for prepared distribution map: 14
No. of specimens digitized: 40
No. of specimens identify: 34
Finalization of the manuscript in progress

29. Revision of Indian Hymenochaetaceae by Mrs. Deepa Mishra, SRF & Dr. J.R. Sharma, Emeritus Scientist:

Described 9 species in detail viz., 1. *Hymenchaete luteobadia* (Fr.) Hoehn. & Litsch., 2. *Hymenochaete rheicolor* (Mont.) Lev. 3. *Hymenochaete rubiginosa* (Dicks. ex Fr.) Lev., 4. *H. villosa* (Léveille) Bresadola., 5. *Hymenochaete unicolor* Berk. &. Curtis, 5. *Hymenochaete vallata* G. H. Cunn., 6. *Hymenochaete variegata* Bresadola, 7. *Hymenochaete villosa* (Léveille) Bresadola, 8. *Hymenochaete tabacina* (Sowerby: Fr.) Lev., 9. *Hymenochaete separabilis* Léger;

Examined and identified 16 field numbers viz., 1. DM427 (*Phellinus gilvus* (Schw.: Fr.)Pat.,) 2. DM429 (*Phellinus conchatus* (Per.: Fr.) Quel.), 3. DM430 (*Hymenochaete rubiginosa* (Dicks.) Lev.), 4. *Phellinus grenadensis* (Murr.) Ryv. (MEH-13-121), 5. *P. rimosus* (Berk.) Pilat. (DM 101), 6. *P. fastuosus* (Lev.) Ryv. (MEH-13-213), 7. *P. ferrugineo-velutinus* (Henn.)Ryv. (MEH-13-213), 8. *P. sublinteus* (Murr.) Ryv. (MEH-13-148)., 9. *Phellinus xerenticus* (Berk.)Peglar (MEH-B-215), 10. *Phellinus gilvus* (Schw.: Fr.)Pat (DM-2-79), 11. *Phellinus merrilli* (Murr.)Ryv. (JRS 2319), 12. (MEH-13-002) *Phellinus cesstii* (Bres.) Ryv, 13. (DM-102) *Phellinus conchatus* (Pers.: Fr.) Quel. 14. (DM-111, DM-103) *Phellinus melleoporus* (Murr.) Ryv., 15. (MEH-13-022) *Hymenochaete rubiginosa* (Dicks. ex Fr.) Lev., 16. (MEH-13-204) *Phellinus senex* (Nees & Mont.) Imaz.

Studied and listed specimens of Hymenochaetaceae housed at BSD, DD and CNH (Cryptogamic section) Howrah viz., *Phellinus grenadensis* (6604), *Phylloporia ribis* (6590), *Phylloporia ribis* (45038), *Phylloporiaribis* (6538), *Phellinus pectinatus* (6625), *P. extensus* (6627), *Hymenochae tevariegata (6623), P. punctatus* (MEH-D-14), *P. crocatus* (6508), *P. gilvus (6501), P. merrillii (MEH-S-28), Phellinus grenadensis* (MEH-D-21), *Phellinus troyanns* (6620), *P. pectinatus* (MEH-B-39), *P.gilvus* (6588), *P. callimorphus* (6555), *Hymenochae temurina* (20005), *Phellinus sanctigeorgii* (20001), *P. hippophaecola* (20002), *P.longisetulosus*, 20003, *P. pseudopunctatus*, 20004, *P. nilgriensis* 20006, *P. sublintus* 20007, *P. merrilli* 20008, *P. smelanodermus*, 20009, *P. durismus* 200010, *P. merrilli 200011*, *P. torulosus* 200012. *P. durissmus* 200013, *Phylloporia ribis* 200014, *Phellinus hippophaecola 200015*, *P. swieteniae 200016*, *P. pruuicola* 200017, *Phylloporia ribis* 200018, *Phellinus nilgriensis*, 200019, *P. gilvus 200020*, *Phyllophoria ribis* 200021, *P.hippophocecola* 200022, *P.troyanns* 200023, *P. dependence* 10003, *P. grenadensis* 100036, *P. purpureogilvus* 100037, *P. inamaenus* 100038, *P. calcitratus* 100039, *P.robiniae 100040*, *P. sanfordii* 100041, *P. badius* 100042, *P. senex* 100043, *Hymenochaete rheicolor* 100044, *Phellinus dependens* 100045, *P. sanfordii* 100046, *P. caryophylli* 100047, *P. merrilli* 100048, *P. inamaenus* 100049, *P. nilgeriensis* 100050, *P. torulosus 100051*, *P. glauecencens* 100052, *P. tuberculosis* 100053, *P.robiniae* 100055, *P. rimosus* 100057, *P. rimosus* 100059, *P. sanctigeorgii* 100060, *Aurificaria luteoumbrina* 45081, *Phylloporiaribis* 45038, *Hymenochaete tabacina* 02077, *Phellinus allardii* 044, *Inonotus porrectus* 10012 ,*Phellinus grenadensis* 10013, *P. caryophyllii* 10017, *P. rimosus* 10018, *P. merrilli* 10019, *P.badius* 10020, *P. rimosus* 10021, *P. caryophyllii* 10022, *P. robiniae* 10024, *P. gilvus* 10026, *P. grenadensis* 10027, *Inonotus rickii* 2001, *Hymenochaete semistupposa* 10031, *Phellinus xeranticus* 20121, *P.gilvus* 45029, *P.acontextus* 10087, *P.pachyphloeus* 12011, *P. ferreus*, 12199, *P. nigricans 12115*, *P. gilvus* 12176, *P. glaucescens* NA-4, *P. enermis* 45071, *P. melleoporus* 45078, *P. sp* 45058, *P. enermis* 45052, *P. allardii* 12204, *P. allardii* 12700, *P.sxerenticus* 12688, *P.allardii 12017*, *P. gilvus* 12037, *P. purpureogilvus* 12092, *Inonotus dryadens* 12604, *I. rickii* 114537, *Coltricia pyrophita 44980*, *Phylloporia ribis* 9112, *P. ribis* 20016. Listed specimens of Hymenochaetaceae housed at BSD, Dehradun; DD, FRI Dehradun.

Conducted a plant collection tour to Song, Loharkhet, Dhakuri forest, Khati and surrounding areas (Distt Bageshwar, Uttarakhand) from 12.09.14 to 28.09.14 (collected 56 field numbers and 102 photographs taken) and to Banikhet, Lakarmandi, Kajihaar, Kalatope and surrounding areas (Distt Chamba, Himanchal pradesh) from 15.10.14 to 26.10.14 (collected 70 field numbers and 182 photographs taken). Studied and identified 33 species viz., 1. *Phellinus ferrus*, 1250; 2. *Phellinus mellanophorus*, 1256; 3. *P. nigricans*, 1257; 4. *P. xerenticus*, 1251; 5. *Inonotus raditus*, 1252; 6. *P. laevigatus*, 1253; 7. *P. allardii*, 1254; 8. *Phellinus sp.*, 1255; 9. *Inonotus flavidus*, 1258; 10. *I. cuticularis*, 1259; 11. *I. tenuicarnis*, 1260; 12. *P. grenadensis*, 1261; 13. *Phylloporia ribis*, 12621; 14. *I. cuticularis*, 1263; 15. *I. glomeratus*, 1264; 16. *Trametes vercicolor*, 1265; 17. *Tomentella radiosa*, 1266., 18. *Phellinus gilvus* (Schw. : Fr.) Pat , 19. *Phellinus inamaenus* (Mont.) Ryv., 20. *Phellinus inermis* (Ell. & Everh.) Cunn., 21. *Phellinus merrillii* (Murr.) Ryv., 22. *Inonotus rickii* (Pat.) Reid, 23. *Phellinus adamantinus* (Berk.) Ryv., 24. *P. badius* (Berk.: Cke.) Cunn., 25. *P.caryophyllii* (Racib.) Cunn., 26. *P.cesatii* (Bres.) Ryv., 27. *P.crocatus* (Fr.) Ryv., 28. *Phellinus luctuosus* (Ces.) Ryv., 39. *P. membranaceus* Wright et Blumenf., 30. *P. minutiporus* Bond. et Herr., 31. *P. pachyphloeus* (Pat.) Pat., 32. *P. orientalis* Bond et Herr., 33. *P. pseudopunctatus* A. David collected from Western Himalaya (Bageshwar and Chamba Distt). Specimens collected during the last survey tours from Bageshwar & Chamba were dried and preserved in Cryptogamic section of BSD. Studied *Coltricia cinnamomea* (Jacq.) Murrill. Ryv., *Coltricia pyrophila* (Wakf.) Ryv., *Coltricia spathulata* (Hook.) Murr., *Asterostroma Cervicolor* (Berk. & Curt) Massee and *Asterostroma muscicolum* (Berk. & Curt) Massee. in detail and completed it in all respects.

30. Flora of Koyana Wildlife Sanctuary, Maharashtra by Ms. Prajakta S. Pathare & Dr. P.G. Diwakar, Joint Director (Retd.):

The major objective of the project is to study the floristic composition of Koyana Wildlife Sanctuary, Maharashtra. The sanctuary spreads over an area of 423.55 sq. kms and it is the part of first tiger project in western Maharashtra, that is 'Sahyadri Tiger Reserve'. This protected area is well known for its wilderness and a dam built over river 'Koyana'. Being protected by the natural boundaries of high mountains of Sahyadri and huge reservoir of Koyana dam, the sanctuary area has nourished diverse flora and fauna.

During the last two years period, the sanctuary area was extensively explored to study the floristic diversity therein. The progress of the work done during the period April 2014 to March 2015 is presented here.

Total number of field tours undertaken: 10 (26 - 27 April 2014; 30 May - 7 June 2014; 21-22 June 2014; 5-6 July 2014; 16-17 August 2014; 23-24 August 2014; 13 - 22 September 2014; 27-28 September; 30 November – 6 December 2014; 20 April- 1 May 2015).

Herbarium tour undertaken: 1 (Department of Botany, Shivaji University, Kolhapur. Tour period 10th- 13th November 2014).

Number of species collected	:	260
Number of species identified	:	156
Number of descriptions prepared	:	140
Number of mounted herbarium sheets	:	738
Number of Exsiccata prepared	:	720
Number of Citations written	:	217

Key findings:

3 New records to Maharashtra
5 New records to Satara District
5 New records for Northernmost distribution

Research Paper Published:

"*Leptochilus decurrens* Bl. Forma *Lanceolatus*, A New Generic Record for Maharashtra, Western Ghats" in Journal of Economic and Taxonomic Botany, Vol. 37 No. 3 (2013).

Research Paper Communicated:

"Occurrence of threatened *Ceropegia santapaui* Wadhwa & Ansari (Apocynaceae) in Northern Western Ghats with additional locations in Koyana Wildlife Sanctuary, Maharashtra" to the Journal of Threatened Taxa.

Research Paper Reviewed:

Reviewed a manuscript for journal *Taiwania* titled, 'Identification of winged fruits of some woody species from Northern Western Ghat'.

31. Pteridophytic Flora of Kudremukh National Park, Central Western Ghats with 10% periphery by Mr. Devendra Tripathi, JRF & Dr. A. Benniamin, Scientist-C:

The Kudremukh National Park encompasses a rich biodiversity of both flora and fauna as of today, situated in the Central Western Ghats region in Karnataka. It has an latitudinal range of 13Ú011 to 13Ú 291 N and longitudinal range of 75Ú 001 to 75Ú251 E. The altitude is between 3000-1892m. The Kudremukh national park comprises forests of hilly terrain, in an area of 600 km², which includes Tungabhadra State forest in the Chickmagalur Revevenue District, Naravi Reserve

Forest in the Dakshina Kannada District and Andar Forest Reserve in Udupi District.

During this year one field tour was undertaken to different parts of Kudremukh National Park, Karnataka for the project spending 8 days and collected 69 species of Pteridophytes. All the collected specimens have been processed, identified and kept in Herbarium of BSI, WRC, Pune. During the tour studied the ecological factors such as altitude, rainfall, temperature forest types and soil type were recorded.

During this year 7 species of spores studied under Scanning Electron Microscope (SEM) namely, *Botrychium daucifolium, Osmunda hugeliana, Bolbitis anguistipinna, Trignospora ciliata, Tectaria coadunata, Leptochillus decurrens, Arachniodes aristata* for the project "Pteridophytic Flora of Kudremukh National Park, Central Western Ghats with 10% periphery. Number of tours undertaken: One tour to KNP, Karnataka (28-10-2014 to 04-11-2014)

Field numbers collected	:	**90**
Number of species collected	:	**69**
Number of identified species	:	**33**
Number of mounted herbarium sheets	:	**50**
Number of descriptions prepared	:	8
Research Paper Published	:	**one**

A.Benniamin, M.S. Sundari, Devendra Tripathi and Praveen kale 2015. *Pteris heteromorpha* fee. New record for Maharashtra, Bio Infolet. Pp.1-2.

32. Microfungi of Biligirirangaswamy Temple Wildlife Sanctuary, Karnataka by Ms. Shreya Sengupta, JRF & Dr. Rashmi Dubey, Scientist -C

The Biligiri Rangaswamy Temple Wildlife Sanctuary (BRT) is a confluence of the Western and Eastern Ghats, with an area of 540 km² has varied habitats forming a unique preserve of natural rainforests. It is a protected reserve under the Wildlife Protection Act of 1972. The site was declared a Tiger Reserve in December 2010. No comprehensive work has been done on microfungal diversity of this protected area. The study of microfungi is important not only to know the fungal population in that area but also these organisms play significant role in the ecosystem and recycling of nutrients by degrading organic matters.

To explore and characterize the fungal population associated with forest regions of BRT Wild Life Sanctuary, field tours had been taken to survey the area extensively in different areas of the sanctuary. The collected samples then processed in the laboratory and microscopic study has been done for detailed study and illustrations. The progress of the work done during the period April 2014 to March 2015 is as follows :-

Numbers of field tours undertaken during the period: - **3** (From 26.05.2014 to 06.06.2014, from 26.09.2014 to 06.10.2014, from 23.03.2015 to 06.04.2015)

Number of specimen collected :- **265** (field nos) foliicolous plant specimens, leaf litter packets & **124** (decaying wood and leaf material (dry specimens).

Total number of samples processed	:	**327**
Microscopic study and photography done	:	**75**
Total number of fungi identified	:	**74**

Identification of the host specimens was done.

Isolation of fungi from the infected plant part in aseptic condition on different culture media.

Sub culturing and maintaining fungal culture in aseptic condition.

Prepared moist chamber incubation for the isolation of fungi.

Literature consultation for identification of fungi.

Preservation of host specimens.

Prepared description of fungi.

Key findings:

2 generic records from India (in the process of detailed study).

1 new record from western ghat

Research papers communicated : Two

33. Capacity Building in Taxonomy ~ Bamboo & Grasses - Work in Co-ordinating Centre at BSI, SRC, Coimbatore (Co-ordinator & PI: Dr. V.J. Nair):

b) **A Taxonomic study of subtribe Sporobolineae (Tribe: Eragrostideae) in India (JRF involved: Shri. S. Arumugam)**: Finalizing the manuscript

c) **A Taxonomic study of the genus *Eragrostis* Wolf in India** (JRF involved: Shri. C. P. Vivek): Submitted the Thesis

34. Revision of the subtribe *Eleusininae* (Poaceae-Chloridoideae) in India excluding *Eragrostis* Wolf by Ms. Mithraja. M.J., JRF & Dr. G.V.S. Murthy, Scientist-F

Field Tour: Conducted four days (from 26th to 29th April 2014) field trip to Silent valley, Kerala and collected three (3) field numbers of Eleusininae.& Conducted One day (17 September 2014) field trip to Pollachi (Aliyar Dam and surrounding areas) and collected Four (4) field numbers.

Herbarium Consultation: Consulted TBGT Kerala and indexed 67 herbarium specimens (13 species) belonging

to the subtribe *Eleusininae* & Photographs of 13 species were taken & Consulted (December 12-19) BSI Pune Circle and indexed 377 herbarium specimens (17 species) belonging to the subtribe *Eleusininae*. Photographs of 17 species were taken.

Illustrations: Dissected and illustrated the habit of four species *Tripogon bromoides*, *Eragrostiella brachyphylla* (Stapf) Bor, *Desmostachya bipinnata* (L.) Stapf is, *Eleusine indica* and *Halopyrum mucronatum* completed.

Descriptions: Preliminary description of ten species of *Tripogon* are completed

35. Grasses of Odisha (Flora of India) by Alok R Chroghe, SRF & Dr. P.V. Prasanna, Scientist-E:

Work Done : Till date 12 field tours and four herbarium consultation tours undertaken to the area and collected 300 field numbers. Identified 280 species. Documented 265 species belonging to 99 genera. In 2014-15 1 field tour was conducted in September 2014 in Odisha and collected 30 field numbers. All collected specimens were identified. Descriptions of 68 species were completed. Plates of 36 species were completed.

36. Flora of Satkosia Tiger Reserve, Odisha (Flora of India Project) by Mr. K. Chandra Mohan, JRF & Dr. P.V. Prasanna, Scientist-E

Work Done: Two field: No. of field tours conducted: 05; No. of Field numbers collected : 519; No. of Species identified: 482; No. of varieties identified: 04; No. of Genera: 319; No. of Families: 87

Satkosia Tiger Reserve is situated in Odisha state and comprises Satkosia Wildlife Sanctuary and Baisipally Wildlife Sanctuary. This is also a meeting point of Eastern Ghats and Chhota-Nagpur Plateau. The project area is having dry, moist deciduous types of forests and also having immense diversity in flora and fauna.

Conducted one Herbarium consultation tour to IMMT (Old: Regional Research Laboratory), Bhubaneshwar in the month of May, 2014 and examined regional plant collections.

Conducted five field tours to Satkosia Tiger reserve in July, September, October, November, 2014 and January, 2015 respectively and collected 519 field numbers. Out of them, identified 482 plant species which belonging to 319 genera, 87 families.

Published 2 research papers

Workshop on Molecular Phylogeny was attended in March 2015.

37. Flora of Kawal Tiger Reserve, Telangana (Flora of India Project) by Ms. Annamma P.S., JRF & Dr. P.Venu, Scientist-E

Work Done :

- 5 field tours were conducted at Kawal Tiger Reserve (Adilabad District of Telangana State)
- May 2014 (3/5/14 - 9/5/14) Field no. Collected : 109. Adilabad & Nirmal Forest Divisions
- Aug 2014 (30/7/14 -4/8/14) Field no. Collected : 89 Jannaram Forest Division
- Sept 2014 (12/9/14-20/9/14) Field no. Collected: 112 Jannaram & Bellampalli Forest Divisions
- Nov 2014 (29/10/14 5/11/14) Field no. Collected : 121 Nirmal Forest Division
- Feb 2015 (4/2/15 - 10/2/15) Field no. Collected : 36 Bellampalli Forest Division
- Published 2 research papers.
- **Digitization of BSID Herbarium Specimens**
- ield data of about **1,700 herbarium sheets** has been entered in Excel Worksheet (61 fields) .
- About **700 herbarium sheets** have been digitalized so far.

1. **Inventorization of Indian *Calanthe* R. Br. (Orchidaceae) with focus on micro-morphology of pollinia** (SERB/DST funded; File No: SB/FT/LS- 397/ 2012) by **Dr. Avishek Bhattacharjee, SERB-DST Young Scientist, Central National Herbarium, Botanical Survey of India**

   Conducted 03 field tours in Eastern Himalayas and South India during which 07 taxa of *Calanthe* (*C. biloba* Lindl., *C. brevicorna* Lindl., *C. herbacea* Lindl., *C. masuca* (D.Don)Lindl., *C. tricarinata* Lindl., *C. trulliformis* King & Pantl. and *C. yuksomnensis* S.Z. Lucksom) were collected. During this period, 09 herbaria (BSHC, CALI, FRC, KFRI, LLOYD, MH, RHT, TBGT, CAL) were consulted and c. 350 specimens were studied. A checklist of Indian *Calanthe* was prepared.

2. **Preventing, extinction and Improving conservation Status of Threatened Plants through application of Biotechnological Tools by Dr A.A. Mao**

3. **Preventing, extinction and Improving conservation Status of Threatened Plants through application of Biotechnological Tools by Shri Amber Srivastava, SRF & Dr S.K. Srivastava, Scientist-D:**

   Seven field tours: [1] Conducted collection tour of Kedarnath area from 10.06.2014 to 13.06.2014 [2] Conducted field tour to Gangotri National Park w.e.f.19.09.2014 to 28.09.2014 [3] Conducted one day field tour to Sahastradhara [4] One day tour to Haridwar [5] A field tour to Jammu is conducted. [6] Conducted a study/training tour to NEHU, Shillong [7] A tour to Devprayag and nearby localities was conducted

   Area covered: c 350 sq. km. **Seven Field tours**: [1] Conducted a collection tour of Kedarnath area from 10.06.2014 to 13.06.2014; Collected stem cuttings of *Skimmia laureola* are planted in BSI nursery for ex-situ conservation; [2] Conducted field tour w.e.f.19.09.2014 to 28.09.2014 to different localities of Gangotri (Uttarkashi) and Tungnath (Rudraprayag) and collected the live plant materials along with GPS data of the concerned species *viz. Malaxis muscifera, Lilium polyphyllum, Ephedra gerardiana* etc. Detailed photographs of the same were also taken. Assessesd the population and distribution data of the concerned RET species along with other desired informations. Besides this, planting material of some other plant species of interest *viz. Paris polyphylla, Saussurea lappa, Arctium lappa, Curcuma aromatic, etc.* were also collected from nursery of HRDC (Mandal) and saplings of *Betula utilis* are also collected from nursery of Chirwasa (Gangotri). [3] Conducted one day field tour to Sahastradhara to check the survival rate and growth of planted saplings of *Pittosporum eriocarpum.* [4] One day tour to Haridwar for locating the population of *Catamixis baccharoides* and collection of live planting material along with soil samples. [5] A field tour to Jammu is conducted to mark the suitable localities for plantation of propagated saplings of *Pittosporum eriocarpum.* [6] Conducted a study/ training tour to NEHU, Shillong for training of Ecological Niche Modelling related to project. [7] A tour to Devprayag and nearby localities was conducted to locate the concerned plant species in wild.

   Propagation Work: Maintenance of the seedling of *Pittosporum eriocarpum* and *Skimmea laureola* raised from cuttings and Tissue culture for planting in the field. Trial for propagation of *Pittosporum eriocarpum* through air layering and stem cuttings. Raised seedlings of *Pittosporum eriocarpum* are shifted to polybags. Collection of *Lilium polyphyllum* bulbs and trial for macro propagation. Tissue culture trials for *Lilium polyphyllum* from bulb scales. Developed saplings through cuttings/macro-propagation and reintroduction 50 saplings of *Pittosporum eriocarpum* and *Erymostachys superba* (15 samplings) in Sahastradhara hills, a type locality and habitats of *Pittosporum eriocarpum.* Tissue culture trials for *Lilium polyphyllum* from bulb scales; Shifting of rooted *Pittosporum eriocarpum* in pots and polybags. Raised seedlings of *Pittosporum eriocarpum* are shifted to polybags. Tissue culture trials for *Lilium polyphyllum* from bulb scales. Plantation of the saplings of *Pittosporum eriocarpum* in Sahastradhara and nearby localities. Raised seedlings of *Pittosporum eriocarpum* are shifted to polybags. Tissue culture trials for *Lilium polyphyllum* from bulb scales. Propagation of *Catamixis baccharoides* and *Eremostachys superba* from seeds. Shifting of raised saplings of *Eremostachys superba* and *Catamixis baccharoides* in polybags; Collected seeds of *Pittosporum eriocarpum* from BSI garden and Dr. YPS Pundir Ji's home. Collection of *Pittosporum eriocarpum* seeds from different localities. Treatment of Pittosporum eriocarpum seeds for sowing. Planted saplings of *Eremostachys superba* in Trikuta hills, J&K. Trial for vegetative propagation of *Pittosporum eriocarpum* through stem cuttings.

Literature Consulted: Different literatures related to occurrence of species in different localities and their respective status are collected and consulted. Literatures related to propagation methods and techniques used for propagating concerned species are also consulted. Prepared Power Point Presentation of the progress of the work done during the last eight months regarding field tours, collected plant species, and their propagation protocol for forthcoming meeting at GOA.

4. **Studies on taxonomy, phytogeography and conservation of South Indian *Habenaria* (Orchidaceae) (SERB-DST) by Dr. K. Prasad, RA**

Conducted 7 field tours in various parts of South India and collected *Habenaria* spp. and carried out 1 herbarium consultation tour to MH.

Listed all the *Habenaria* species represented in India based on available literature and field tours and submitted the annual progress report to DST, Delhi.

ASSISTANCE TO BOTANIC GARDEN SCHEME OF MINISTRY OF ENVIRONMENT, FORESTS & CLIMATE CHANGE, NEW DELHI.

Botanical Survey of India is the implementing agency of the ABG scheme of MoEF& CC, New Delhi. Every year proposals are received and processed by BSI to facilitate the funding agency according to the guidelines framed. Proposals received are scrutinized with the help of the experts in BSI. Proper inspection of the proposed site is conducted before recommending the proposals to the Expert Group. During FY 2015- 16 a fund of Rs.1, 21, 45, 688/- (Rupees One Crore Twenty One Lakhs Forty Five Thousand Six Hundred and Eighty Eight only) is released to strengthen 3 Lead Gardens and one Plant Conservation project at the Heritage site. A total of 9 new proposals received this year, which is to be put up in the next Expert Group Meeting for consideration is attached as Annexure- III. Altogether 19 proposals were recommended for funding by the Expert Group in its meeting held on 28. 10. 2014 at Indira Paryavaran Bhavan, MoEF& CC, New Delhi is described with progress of the Scheme, in Annexure - II. Projects sanctioned before the last Expert Group meeting for which still funding supported is provided is enclosed as Annexure –I. Inspection of various gardens to which financial assistance has been provided is inspected time to time by Scientists of BSI to evaluate the progress of the project.

ABG FUND TO BE TRANSFERRED DURING 2015- 2016 ˜ Annexure -I

(Projects sanctioned before last Expert Group meeting held on 28. 01. 2014)

S. No.	Name of Institution/PI	Sanction letter no./date	Total Amount approved (Rs.)	Amount Released so far	Amount to be Released	Remarks/ Instalment to be Released
1.	Aligarh Muslim University, Aligarh/Prof.ArimInam	10/21/2010-CS/BG 29/04/2014	39,20,000	29,75,000	9,45,000	3rd and Final Not Released
2.	SK Rajastan Agricultural University, Bikaner/Prof. P.C. Gupta	10/36/2010-CS/BG 26/06/2014	22,80,000	20,00,000	2,80,000	3rd and Final Not Released
3.	GKVK, Bangalore/Dr. M. D. Rajanna	10/08/2012-CS/BG 07/07/2014	75,00,000	29,40,000	12,70,000	3rd Not Released
4.	Biju Patnaik MPGRI, MSSRF, Koraput/Sujanendra Swain	10/02/2014-CS/BG 21/8/2014	14,16,500	11,33,200	2,83,300	2nd and Final Not Released
5.	Devchand College, Arjunnagar/ Dr. V.S. Khude	10/04/2014-CS/BG 26/08/2014	12,16,628	9,73,302	2,43,326	2nd and Final Not Released
6.	Tropical Botanic Garden and Research Institute,Trivandrum/Dr.A.G. Pandurangan	10/02/2008-CS/BG 28/07/2014	76,14,000	60,00,000	16,14,000	5th and Final Not Released
7.	Punjabi University, Patiala/ Dr. N.S. Atri	10/05/2014-CS/BG 08/09/2014	40,00,000	20,00,000	20,00,000	2nd and Final Not Released
8.	G B Pant, Almora/ Dr.Ranbeer S. Rawal	10/02/2013-CS/BG 29/09/2014	82,03,000	49,99,000	11,64,000	3rd Not Released
9.	Arts, Science & Commerce College, Kolhar, Ahmednagar/ Dr. M.D. Shinde	10/03/2014-CS/BG 26/11/2014	10,00,000	8,00,000	2,00,000	2nd and Final Not Released
10.	Shivaji University/Kolhapur Maharashtra Dr. S.R. Yadav	10/04/2012-CS-BG 19/11/2013	99,67,637	30,00,000	16, 19, 649	2nd Released
11.	Tejpur University Nappam/Assam Dr. S. S. Bhattacharya	10/11/2013-CS/BG 27/06/2013	28,80,593	14,40,296	14,40,297	2nd and Final Not Released
12.	Mangalore University, Mangalagangotri,/Mangalore Dr. G. Krishankumar	10/14/2010-CS/BG 29/10/2013	15,26,000	14,63,000	63,000	Remaining Amount of 2nd Instalment Not Released
13.	Malabar Botanic Garden, Kozhikode, Kerala / Dr. Prakash Kumar	10/32/2010-CS/BG 08/10/2014	35,00,000	25,00,000	10,00,000	3rd and Final Not Released
14.	KFRI, Nilambur, Kerala	10/10/2011-CS/BG 28/02/2012	8,72,000	8,00,000	72,000	Remaining amount of 2nd Instalment Not Released
Total Amount Required – Rs.1,02,13,004/-(One Crore Two Lakhs Thirteen Two Thousand four only)						

ABG SANCTIONED PROJECTS FUNDS TO BE TRANSFERRED AS PER THE EXPERT GROUP MEETING HELD ON 28.10.2014 Annexure - II

Sl. No.	Name of the Project	Name of the Institution	Total Amount Sanctioned Rs.)	Duration (Years)	First year budget	Remarks
1	Improvement of Infrastructure facilities of Botanic Gardens, Botanic Gardens and Centres of Ex-situ Conservation and Propagation of RET Plants, and Plants Endemic to the region	ShivramaKaranthaPilikiulaNisargaDhama, Vamanjoor Post, Mangalore (Lead garden project).	95,62,500/-	5	9, 90, 000	Note approved by Director, BSI, Inspection done by Dr. Murthy Send to ministry for approval
2	Improvement of Infrastructure facilities of Botanic Gardens, Botanic Gardens and Centres of Ex-situ Conservation to facilitate Propagation of Indigenous particularly RET Plants, Plants Endemic to the region	The Agri -Horticultural Society of India, 1, Alipore Road, Kolkata (Lead garden project).	42,33,924/-	3	30, 00, 000	First year civil works, Under Process (Put on hold due to lack of fund)
3	Ex-situ Conservation and Propagation of RET Plants	The Science Foundation for Tribal and Rural Resource Development, Baramunda, Bhubaneshwar	67,47,799/-	5	39,33, 484	Sl. No. 1 & 2 of the budget, Send to ministry for approval
4	Improvement of Infrastructure facilities, establishment of Plant components and other structural components in Botanic Garden	Department of Environmental Science, Maharashtra UdayagiriMahavidyalaya, Udgir- Dist. Latur, Maharastra.	29,41,000/-	3	18,80,000	Sl. No. 1,2,3,4 &7 of the budget Under Process
5	Improvement of Infrastructure facilities in Botanic Gardens, Botanic sections and Centres of Ex-situ Conservation of Indigenous particularly RET Plants and Plants Endemic to the region	S.V.U. College of Sciences, S.V. University, Tirupati.	17,10,000/-	3	12, 68, 000	All the items in first year Under Process,(Put on hold due to lack of fund)
6	Introduction of RET species and Infrastructure improvement in Botanic Garden	Biodiversity Division, Institute of Forest Genetics & Tree Breeding, ICFRE, Coimbatore, Tamil Nadu.	18,79,000/-	3	12, 49, 000	All the items in first yearUnder Process (Put on hold due to lack of fund)

7	Establishment of Lead Botanic Garden	COGCEHR, FEEDS Hengbung, P.O. Kangpokpi, Senapati District, Manipur.	94,52,955/-	3	63,01,970	½ of the total budget Under Process,(Put on hold due to lack of fund)
8	Ex-situ conservation of rare, endangered, threatened, endemic & economic plant resources of Western Himalayan region through Botanical Garden	Biodiversity Division, CSIR- Institute of Himalayan Bioresource Technology, Palampur, H.P	1,07,72,000/-	3	33, 51, 400	Sent to ministryUnder Process Send to ministry for approval
9	Development of Herbal Garden	Herbal Research laboratory, Ramakrishna Vivekananda Mission, Institute of Advanced Studies, Kolkata.	8,39,261/-	3	4, 19, 630	½ of the total budgetUnder Process Send to ministry for approval
10	Establishment of Thematic Botanical Garden to conserve important plant species	Environmental Science & Natural Resource Management, School of Natural Sciences Shiv Nadar University, Village Chithera, Tehsil Dadri, GautamBudh Nagar (UP)	79,14,375/-	3	49, 59, 375	1 year as per approved minutes (revised budget)Under Process
11	Strengthening of Botanical Garden through Ex-situ Conservation and Propagation of RET Plants, and Plants resources of North Western Himalaya	Department of Forest Products, Dr. Y.S. Parmar University of Horticulture and Forestry, Nauni, Solan-173230	1,65,16,000/-	5	83, 17, 000	1 year as per approved minutes (revised budget)Send to ministry for approval
12	Ex-situ Conservation and Maintenance selected of RET and potential Native Ornamentals of North Western Himalayan Regions of Himachal Pradesh	Department of Floriculture and Landscape Architecture, Dr. Y. S. Parmar University of Horticulture and Forestry, Nauni, Solan (Himachal Pradesh).	17,13,800/-	3	8, 51, 400	As per Expert group adviceUnder Process, ,(Put on hold due to lack of fund)
13	Establishment of Conservation Centre for Cycads with special Reference to Indian Cycas Linn.	Botanic Garden, CSIR-National Botanical Research Institute, Rana Pratap Marg, Lucknow. (Lead Botanic Garden Phase–II).	1,23,15,500/-	5	45, 30, 000	As per Expert group advice AND Inspection Report,Send to ministry for approval

14	Ex-situ Conservation and Propagation of Threatened and Endemic Plants of Eastern Ghats of India	Department of Botany, Yogi Vemana University, Kadapa (Lead Garden Project).	97, 09, 640/-	3	46, 57, 880	As per Expert group adviceUnder Process
15	Ex-situ Conservation of RET Plants, Endemic and Economic plants of North East Region	Botanical Survey of India, Eastern Regional Centre, Shillong, Meghalaya, (Lead Garden Project)	1,37,000,78/-	5	40, 00,000	Already sanctioned
16	Ex-situ Conservation and Propagation of Indigenous, Threatened and Endemic Plants through Improvement of Infrastructure Facilities in National Orchidarium& Experimental Garden" (NOEG)	Botanical Survey of India, Southern Regional Centre, Lawley Road (P. O), TNAU Campus, Coimbatore, Tamil Nadu, India (Lead Garden Project).	99, 83,433/-	5	61, 26, 039	Already sanctioned
17	Improvement and Up gradation of the facilities and Infrastructure in the Botanical Garden of the Centre for Plant Molecular Biology (CPMB)	Centre for Plant Molecular Biology (CPMB), Osmania University, Hyderabad, Telangana State.	34,80,000/-	3	10, 92, 000	Only civil worksUnder Process .(Put on hold due to lack of fund)
18	Conservation, Informatics Management and Bio- prospecting of RET & Endemic Plants of Indian Desert	Central Arid Zone Research Institute (CAZRI), Jodhpur (Lead Garden Phase II project).	1,41,73,400/-	5	10, 50, 740	As per Noting and Approved by Director BSI , Sent to Ministry
19	Botanical Gardens and Heritage Gardening Sites in India: Plant Introduction and Conservation	Society for Conservation and Resource Development of Medicinal Plants, Ashok Vihar, New Delhi.	12, 10, 000/-	2	4,00,000	Already sanctioned

50% of the First Year budget in total except 3 already sanctioned by to Ministry: Rs. 2, 19, 51, 439.5/- (Grand Total First Year- Rs. 4, 39, 02, 879/-)

HERBARIUM INFORMATION

Maintenance of Herbarium, Incorporation, Loan, Exchange of Specimens etc.

Sl. No.	Herbarium Maintenance	NRC	APRC	SHRC	CRC	AZRC	WRC	DRC	SRC	ERC	ANC	CNH	Total
1	No. of Specimens mounted/ labelling	2270	8732	1353	48	3337	93	569	885	3590	1769	690	**23336**
	No. of Specimens Labelling	-	1232	800	-	4173	-	-	1050	3422		729	**11406**
2	No. of Specimens segregated/ remounted	2103	-	-	-	-	-	90	973	1551	15	1043	**5775**
	Remounted								88			1408	**1496**
3	Stitching/ re-stitching	9374	8131	946	88	3955	763		1185	3040	1111	-	**28593**
4	Changing cover (species cover)	02	--	12	42		15	80	390	112	2695	1161	**4509**
	Changing cover (Genus cover)								822	99			**921**
5	No. of Specimens incorporated/ Reincorporated	2152	5084	1082	3544		286	1401	4219	7398	1978	3547	**30691**
6	No. of Specimens sent on loan	04		13					54		1111	83	**1265**
7	No. of Specimens received on exchange		7					243	39		557	98	**944**
8	Type photographs received from Kew		9										**9**
9	Received as gifts	66			11							12	**89**
10	No. of Specimens poisoned/ fumigated	1988	2220	761	136		1463	1444	495+441	3860		2391	**14263**
11	No. of Species identified	122	38	537	1416	729			51	63	09	255	**3220**
12	Herbarium sheets accessioned	468	3455	3169	2069		292		6846	2030	2,073		**20402**
13	Addition of species cover			13	284								**297**
14	Type specimens/Images received						2 Type sp.			18			**20**
15	No. of specimens received on loan	34			10			4	28			98	**174**
16	No. of loan specimens returned	21			3113					78			**3212**
17	Dusting herbarium/duplicate specimens.	16171		761	1179								**18111**
18	Field Data written			514		592							**1106**
19	Herbarium Data Entry			3000									**3000**

Photographic Digitization of Economic Herbarium specimens at ISIM, BSI, Kolkata: Photographic digitization of 20,000 Economic Herbarium Specimens at ISIM, Kolkata along with Metadata completed.

Digitization and scanning of Herbarium specimens in BSD (NRC): 2725 Herbarium Specimens of the family Ranunculaceae,Grossulariaceae, Iteaceae, Verbenaceae, Rosaceae, Menispermaceae, Berberidaceae, Nymphaeaceae, Papeveraceae, Fumariaceae and Poaceae including 280 pteridophytes specimens completed.

MADRAS Herbarium, SRC:

- Completed the entry of label data of 2000 specimens (in duplicates) of Kerala-grasses for accessioning.
- Data base created for the project entitled "Tamil Nadu – Grasses" collected by Dr. Althaf Ahmed Kabeer by R. Mehala Devi, Senior Preservation Assistant & M. Anantha Lakshmi, Senior Preservation Assistant (Totally – 20 Field books completed 4350 entries.)
- 386, Sri Lankan type specimens were barcoded and details were entered in type data base. (Barcode: No: MH00002788 - MH00003175) by R. Mehala Devi, Senior Preservation Assistant.

Service Rendered in 2014-15

A. Public services rendered

During 2014-15, BSI disseminated scientific information to public and also assisted scientists, researchers, students and academicians in their pursuit of taxonomic research on systematic botany. During the period, 14,285 visitors, including scientists, students, teachers and VIPs, visited different botanic gardens, herbaria and museum of different regional centres of BSI. Apart from that, 1,66,607 general visitors and more than 1200 students, researchers, forest trainees, VIPs and other dignitaries exclusively visited the AJCB IBG, Howrah. Queries on plant distribution, nomenclature, threatened and endemic taxa of different regions, etc., were attended by experts; 14715 specimens of angiosperms, pteridophytes, bryophytes and fungi, received from students/scientists outside BSI were identified and photocopies of *c.* 4400 pages of literature were supplied. A total of 41 plant samples (36 Red sandalwoods; 2 white sandalwoods; 1 Brown sandalwood; 2 vegetable crude drugs), received from various law enforcing agencies of government, were pharmacognostically authenticated.

B. Scientific Workshop/Seminar organized

A workshop on 'Taxonomy and Biosystematics of Vascular Plants' (14-7-2014 to 22-7-2014) was organized by Calcutta University in association with BSI and SERB, DST in Dept. of Botany, Calcutta University. Arrangements were made for practical training and demonstration of herbarium methodology at Central National Herbarium and for visit to different sections of CNH & AJC Bose Indian Botanic Garden for participants of workshop.

C. Revenue earnings

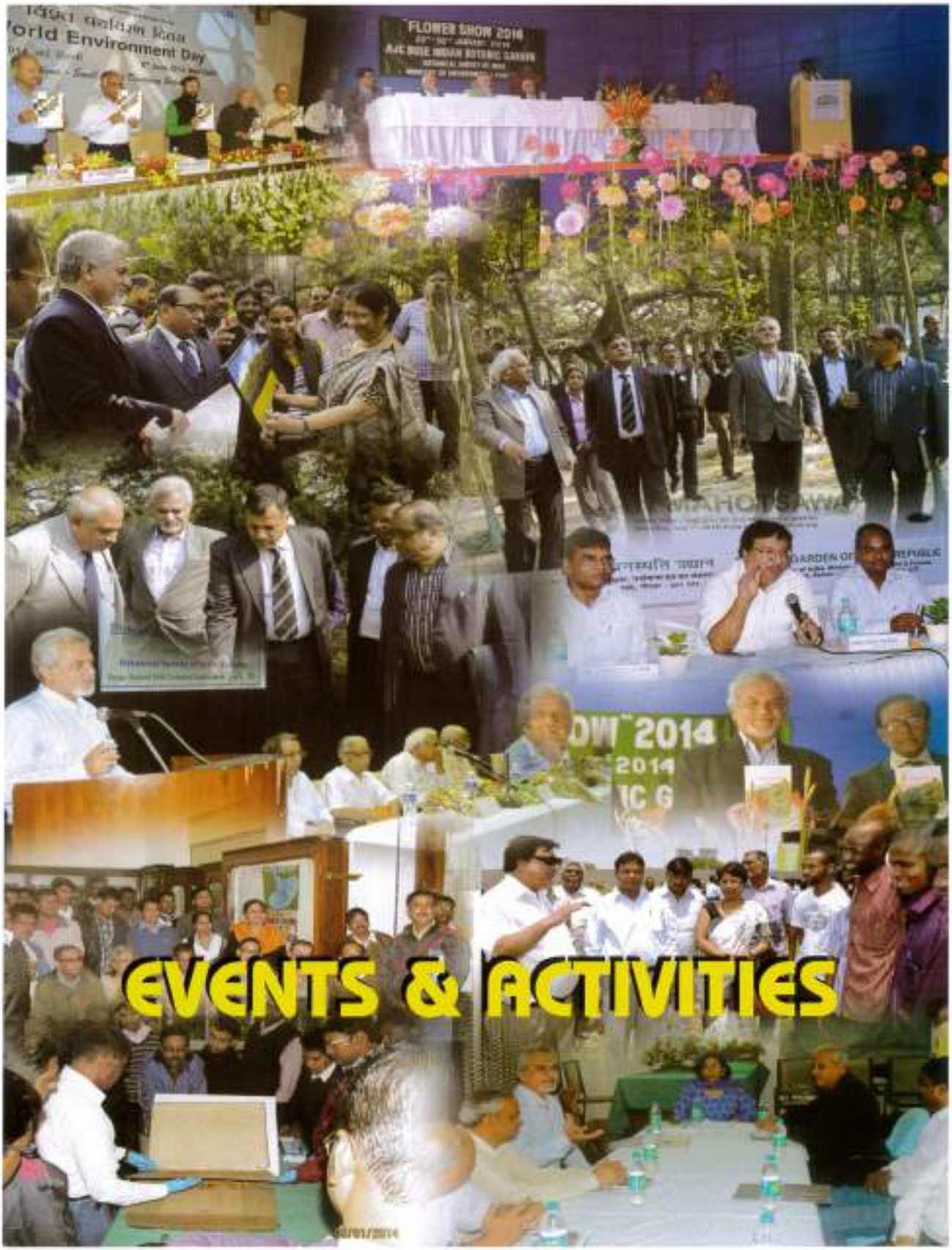
During the period, BSI earned Rs. 64,49,184/- which includes Rs. 66,215/- towards identification charges of specimens/crude drug samples, Rs. 2,08,205/- towards sale of departmental publications, Rs. 2,441/- towards photocopying of literature and rest amount towards miscellaneous services.

Demonstration of Herabarium techniques to students at Northern Regional Centre, Botanical Survey of India, Dehradun

Dr. A. K. Sahoo, exhibits the colletions to Dr. Vendra King

Visits of students from various schools and colleges Dhannikhari Experimental Botanic Garden cum arboretum, Andaman & Nicobar Island

Students participation in plant introduction on the occassion of International Day for Biodiversity at Portblair, Andaman & Nicobar Islands



EVENTS & ACTIVITIES

Shri Prakash Javadekar, Hon'ble Minister of State (Independent Charge) releasing Plant Discoveries 2013 on the occasion of World Environment Day 2014

Shri M. K. Narayanan, Former Governor of West Bengal with Dr. P. Singh, Director, BSI, during inaugural day of Flower Show at AJC Bose Indian Botanical Garden, Howrah on 28 Jan 2014

Director, BSI presenting a potrait of Banyan Tree to the Chief Justice of Calcutta High Court

Secretary, MoEF & CC visiting The Great Banyan Tree, AJCBIBG along with Director, BSI and In-Charge, AJCBIBG

Secretary, MoEF & CC visiting Garden Nursery, AJCBIBG along with Director, BSI & Director, ZSI and In-Charge, AJCBIBG

Shri Hem Pande, IAS speaking to participants on the occasion of Van Mahotsav at Botanic Garden of Indian Republic, Noida

Dr. P. Singh, Director, BSI along with Dr. D. K. Singh and Dr. H.S. Debnath releasing books during Flower Show at AJC Bose IBG, Howrah on 30 Jan 2014

Dr. P. Singh, Director, BSI addressing the participants during inaugural function of the seminar on "Excitements in Taxonomy & Ethnobotnay" for young researchers on 19 June 2014

Visitors from Nigeria interacting with Shri Hem Pande, IAS during Van Mahotsav 2014 at BGIR, Noida

Dr. R. Dalwani, Advisor, MOEFCC, conducting meeting with Director, Botanical Survey of India and other officials

Participants during Conservation Workshop at ISIM Kolkata

Live demonstration during the workshop on Conservational Technics of Archives Material on 19 June 2014

Students from different institutions participating in National Dialogue on Plant Taxonomy and Plant Conservation at Northern Regional Centre, Botanical Survey of India, Deharadun

Swachh Bharat Pldege being administered in AJCBIBG on 2nd October 2014

Sit & Draw Competition during the World Environment Day at AJCBIBG, Howrah

BOTANICAL SURVEY OF INDIA

Budget Estimates
2014-2015

(Rupees in thousand)

		Plan	Non-Plan	Total
01	Survey (Botanical) (Sub Major Head)			
3435.01.001	Direction and Administration(Minor Head)			
01	Headquarters Office (Sub Head)			
01.00.01	Salaries	2200	27200	29400
01.00.02	Wages	0	0	0
01.00.03	O.T.A.	65	225	290
01.00.06	Medical Treatment	100	350	450
01.00.11	Domestic Travel Expenses	150	125	275
01.00.13	Office Expenses	500	270	770
01.00.20	Other Admn. Exp.	2100	40	2140
01.00.28	Professional Services	1200	0	1200
01.00.30	Other Contractual Services	1500	0	1500
01.00.31	Grant-in-aid	0	45	45
	Total: Hqrs.	**7815**	**28255**	**36070**

		Plan	Non-Plan	Total
02	Indian Botanic Garden (Sub Head)			
02.00.01	Salaries	200	23500	23700
02.00.02	Wages	0	0	0
02.00.03	O.T.A.	15	500	515
02.00.06	Medical Treatment	0	300	300
02.00.11	Domestic Travel Expenses	100	50	150
02.00.13	Office Expenses	400	300	700
02.00.20	Other Admnm. Expenses	0	300	300
02.00.28	Professional Services	7385	0	7385
02.00.30	Other Contractual Services	6000	0	6000
	Total: Indian Botanic Garden	**14100**	**24950**	**39050**

(Rupees in thousand)

		Plan	Non-Plan	Total
03	Regional Offices (Sub Head)			
03.00.01	Salaries	8400	35000	43400
03.00.02	Wages	20	285	305
03.00.03	O.T.A.	98	215	313
03.00.06	Medical Treatment	260	700	960
03.00.11	Domestic Travel Expenses	775	500	1275
03.00.13	Office Expenses	13625	765	14390
03.00.20	Other Admn. Exp.	350	0	350
03.00.28	Professional Services	335	0	335
03.00.30	Other Contractual Services	200	0	200
03.00.31	Grant-in-aid	9595	0	9595
	Total: Regional Offices	**33658**	**37465**	**71123**
	Total: Direction &Admn.	**55573**	**90670**	**146243**
3435.01.004	Research			
01	Indian Botanic Garden			
01.00.01	Salaries	1400	67000	68400
01.00.02	Wages	500	0	500
01.00.03	O.T.A.	50	500	550
01.00.06	Medical Treatment	100	500	600
01.00.11	Domestic Travel Expenses	200	250	450
01.00.13	Office Expenses	3800	300	4100
01.00.21	Supplies & Materials	0	0	0
01.00.27	Minor Works	2000	0	2000
	Total: Indian Botanic Garden	**8050**	**68550**	**76600**

		Plan	Non-Plan	Total
02	Regional Offices			
02.00.01	Salaries	39500	86700	126200
02.00.02	Wages	1793	150	1943
02.00.03	O.T.A.	270	470	740
02.00.06	Medical Treatment	1240	1450	2690
02.00.11	Domestic Travel Expenses	3535	1000	4535
02.00.13	Office Expenses	23300	1100	24400
02.00.21	Supplies & Materials	2200	0	2200
02.00.27	Minor Works	10200	0	10200
02.00.34	Scholarship & Stipend	8100	0	8100
	Total : Regional Offices	**90138**	**90870**	**181008**

(Rupees in thousand)

		Plan	Non-Plan	Total
03	Headquarters Office			
03.00.01	Salaries	5979	28600	34579
03.00.02	Wages	0	0	0
03.00.03	O.T.A.	60	60	120
03.00.06	Medical Treatment	200	90	290
03.00.11	Domestic Travel Expenses	1700	225	1925
03.00.12	Foreign Travel Expenses	500	45	545
03.00.13	Office Expenses	28000	90	28090
03.00.16	Publication	2500	0	2500
03.00.21	Supplies & Materials	0	0	0
03.00.27	Minor Works	300	0	300
03.00.34	Scholarship & Stipend	4800	0	4800
	Total : Headquarters Office	44039	29110	73149
	Total: Research	**142227**	**188530**	**330757**

		Plan	Non-Plan	Total
3435.01.005	Investigation			
03.00.01	Salaries	0	0	0
03.00.02	Wages	0	0	0
03.00.03	O.T.A.	0	0	0
03.00.06	Medical Treatment	0	0	0
03.00.11	Domestic Travel Expenses	0	0	0
03.00.13	Office Expenses	0	0	0
03.00.20	Other Administrative Expenses	0	0	0
3.00.27	Minor Works	0	0	0
03.00.34	Scholarship & Stipend	0	0	0
	Total : Regional Offices	**0**	**0**	**0**

		Plan	Non-Plan	Total
03	Botanic Garden of Indian Republic			
03.00.01	Salaries	0	0	0
03.00.02	Wages	100	0	100
03.00.03	O.T.A.	0	0	0
03.00.06	Medical Treatment	0	0	0
03.00.11	Domestic Travel Expenses	300	0	300
03.00.12	Foreign Travel Expenses	0	0	0
03.00.13	Office Expenses	4500	0	4500
03.00.21	Supplies & Materials	300	0	300
03.00.28	Professional Services	500	0	500
03.00.30	Other Contractual Services	6500	0	6500
03.00.34	Scholarship & Stipend	0	0	0
	Total Botanic Garden of Indian Republic	12200	0	12200
	Total : Investigation	12200	0	12200
	Total : Survey (Botanical)	**210000**	**279200**	**489200**